

# METAL FINISHING

NOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

Founded as Metal Industry, January, 1903  
by Palmer H. Langdon, 1868-1935

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## Published Monthly by

METAL INDUSTRY PUBLISHING CO., INC.  
11 West 42nd St. New York 18, N. Y.  
Telephone: PENnsylvania 6-0226

## also publishers of

*Organic Finishing*, monthly, \$1.00 per year  
*Guidebook-Directory for the Metal Finishing Industries*, annually, \$1.50



Copyright 1947 by The Metal Industry Publishing Company, Incorporated. Entered February 25, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879. Re-entered as second class matter June 13, 1940, at the post office at New York, N. Y., under the Act of March 3, 1879.

SUBSCRIPTION PRICES: United States, \$3.00 and Canada, \$3.00 per year. Other countries \$7.50. Single copies 35c in U. S. and Canada, Foreign 75c. Please remit by check or money order; cash should be registered.

Contributed articles, communications, etc., on pertinent subjects are invited. Their publication, however, does not necessarily imply editorial endorsement.

JUNE, 1947

VOL. 45 • NUMBER 6

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## COMING SOON

Abstracts of the papers given at the Annual Convention of the American Electroplaters' Society.

Installation of a job-shop utilizing a unique method of work transference with minimum handling.

Description of equipment in the electroplating control laboratory with information on laboratory limitations.

Determination of silver and copper in plating solutions, giving short cut methods as used in control applications.

# LEA

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COMPOUND

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OPTICAL  
COMPANY**

The American Optical Company, manufacturer of SPENCER Scientific Instruments, uses a LEA Method and LEA Compounds for finishing many parts on their well-known No. 820 Microtome. This is a precision instrument widely used in hospital and laboratory work—work that demands the utmost in precision manufacture and finish.

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# THE LEA MANUFACTURING CO.

*Burring, Buffing and Polishing... Manufacturers and Specialists  
in the Development of Production Methods and Compositions*

## Finishing Salesmanship

One of the most important events in the finishing field in recent years is the combined Annual Convention and Industrial Finishing Exposition held under the auspices of the American Electroplaters' Society in Detroit, June 23-27.

At the Convention there will be talks given by some of the best-informed men in the industry on a wide variety of subjects which are of concern to all electroplating executives. Major topics at the final business meeting will include the much-discussed change in constitution and in name. Election of officers and selection of the 1948 Convention city are other matters before the meeting.

For the first time in eleven years the Society is having an Exposition. In the words of the general chairman, *George L. Nankervis*, "we in Detroit are attempting not only to acquaint all individuals interested in finishing with the latest developments in equipments and supplies by means of the Exposition exhibits, but the entire program has been designed to sell metallic and organic finishes to the executive, the engineer and designer, management personnel and the general public".

This policy of long range salesmanship of the surface treatment field is most commendable. Obviously, we who are directly concerned with the field realize its tremendous importance and do not have to be sold; in fact we are constantly striving to make it bigger and better. It is the individual who specifies the product and who is not directly connected with the field that must be sold on metallic and organic coatings, as against substitutes. From a still longer range view, the general public should be educated in the importance of industrial finishes so that the consumer will demand them.

With this in mind, it becomes the responsibility of each one of us to not only visit the Exposition and catch up on developments in the industry, but to actually sell the field to those who are not fully informed.

We'll see you then, in Detroit, with our best foot forward!

# American Electroplaters' Society

## Annual Convention June 23-26

THE 34th annual convention of the *American Electroplaters' Society* is to be held at the *Hotel Statler* from June 23rd through June 26th. In conjunction with the convention the *Industrial Finishing Exposition* will be held at *Convention Hall*, Detroit.

Registration may be made on the *Ballroom Floor* of the *Hotel Statler* on Sunday afternoon, June 22nd at 3:00 P.M., Monday morning at 8:00 A.M. and Tuesday, Wednesday and Thursday mornings at 8:30 A.M. The fee for men and women is seven dollars and fifty cents which entitles the registrant to a book of tickets to be used for all A. E. S. functions and activities. Registrants need not be members of the Society.

The *Hotel Committee* is turning over its entire file to the *Registration Committee* during the Convention. Questions and requests for information concerning hotel reservations should be made at the registration desk.

The general chairman of the Convention and Exposition is *George L. Nankervis* and the general treasurer, *Walter L. Pinner*. The various committee chairmen who are largely responsible for this year's Convention and Exposition are as follows:

Educational, *R. B. Saltonstall*; Entertainment, *R. L. Redmond*; Finance, *George A. Pillsbury*; Registration, *Frank L. Clifton*; Hotel, *J. E. Bunch*; Program, *B. C. Case*; Transportation, *C. L. Southwick*; Advertising and Publicity, *Frank Watt*; Exhibits (Exposition), *H. E. Head* and *E. F. Berry*; Job Shop, *Henry J. Bock*; Plant Visitation, *C. R. Beaubien*; Women's Committee, *Mrs. George A. Pillsbury*.

The *International Fellowship Club* will hold a luncheon exclusively for suppliers and their representatives on Monday, June 23, at 12:30 P.M. Following the luncheon, election of officers for the coming year will be held as well as a discussion of the arrange-

ments for the *Open House* party sponsored by the club, which is to be held in the *Grand Ballroom* of the *Statler* at 8:30 P.M. that evening. A golf tournament under the sponsorship of the club will be held Tuesday, June 24, at 12:30 P.M. at the *Western Golf Club*.

The *Ladies Program* includes a visit to the *Ford Museum* where early American history is depicted, and to *Greenfield Village*, with luncheon at the beautiful *Dearborn Inn*. An opportunity to take part in an early morning radio breakfast program is also scheduled for the ladies. A luncheon at the spacious *Detroit Yacht Club* on *Belle Isle* is arranged. A fashion show in the beautiful Early American rooms of the *J. L. Hudson Company* especially staged for the ladies, during an early morning breakfast, is part of the program. Several other functions have been planned for the pleasure of the ladies although the



Frank Savage  
Supreme President



Kenneth M. Huston  
Supreme First Vice-President



S. S. Johnston  
Supreme Second Vice President





Arthur Logozzo  
Supreme Third Vice-President



Dr. A. Kenneth Graham  
Executive Secretary and Business Manager



Walter L. Pinner  
General Chairman and Past President

program has been so arranged as to allow plenty of time for shopping or to visit other points of interest.

At 6:30 P.M. Wednesday, June 25, a dinner will be held in the *Michigan Room* of the Statler for the members of the *National Association of Metal Finishers, Inc.* This group is the national body of the various job-shop branches.

The final business session, election of officers and selection of the 1948 convention city is scheduled for 2:00 P.M. Thursday, June 26, in the Grand Ballroom. Thereafter the annual banquet is arranged at 7:00 P.M. Dinner, floor show, dancing and the distribution of awards will be made at that time.

## Official Program

### SUNDAY—JUNE 22

#### Afternoon—3 P.M.

Beginning of registration on the ballroom floor of the *Hotel Statler*.

### MONDAY—JUNE 23

#### Morning—10:00 A.M.

Buses leave *Bagley Street* entrance of the *Hotel Statler* for a tour of *Greenfield Village* with lunch at the *Dearborn Inn* for all of the ladies attending the Convention.

Opening Session: Grand Ballroom of *Hotel Statler*, presiding: *George L. Nankervis*, Convention General Chairman.

Invocation: *Dr. Herbert Beecher Hudnut*.

Formal Opening of 1947 Convention: *George L. Nankervis*, Convention General Chairman.

Welcome to Detroit: *Hon. Edward J. Jefferies, Jr.*, Mayor, City of Detroit.

Greetings from the Detroit Branch: *W. W. Wilson*, President, Detroit Branch.

Report of the Supreme President: *Frank K. Savage*, Supreme President, American Electroplaters' Society.

#### Noon—12:30 P.M.

Luncheon of the International Fellowship Club; exclusively for suppliers and their representatives.

#### Afternoon—2:00 P.M.

First Educational Session: Presiding, *Charles L. Faust*.

*All Educational Sessions To Be Held In The Grand Ballroom*

#### Evening—8:30 P.M.

Open House sponsored by the International Fellowship Club in the Grand Ballroom. Dancing, buffet lunch and refreshments.

### TUESDAY—JUNE 24

#### Morning—8:30 A.M.

Visit by the ladies to the *WWJ Coffee Club* broadcast.

#### Morning—9:30 A.M.

Second Educational Session. Presiding, *Floyd Oplinger*.

#### Noon—12:00 M.

Luncheon of the *Plating Institute* of Michigan membership in the Michi-

gan Room of the Statler.

#### Noon—12:30 P.M.

Golf tournament under the sponsorship of the International Fellowship Club held at the *Western Golf Club*. Buses leave the *Bagley Street* entrance of the Statler at 12:30 P.M.

#### Evening—8:00 P.M.

Moonlight cruise in *Lake St. Clair*. Shuttle buses to leave the *Bagley Street* entrance of the Statler starting at 8:00 P.M.

### WEDNESDAY—JUNE 25

#### Morning—9:30 A.M.

Third educational session: Presiding, *Arthur McNeil*.

#### Noon—11:30 A.M.

Luncheon for the ladies at the *Detroit Yacht Club*. Buses leave the Statler, *Bagley Street* entrance.

#### Noon—12:15 P.M.

Luncheon for men only at the *Masonic Temple*. Buses leave *Bagley Street* entrance at 12:15 P.M. Guest speaker will be *Edgar A. Guest*.

#### Afternoon—2:30 P.M.

Fourth Educational Session: Presiding, *E. T. Candee*, Chairman of the Research Committee.

#### Evening—6:30 P.M.

Dinner for the members of the *National Association of Metal Finishers, Inc.*, only in the *Michigan Room* of the *Hotel Statler*.



E. T. Candee  
Chairman, A.F.S. Research Committee



George L. Nankervis  
General Chairman



R. B. Saltonstall  
Chairman, Educational Committee

## THURSDAY—JUNE 26

### Morning—8:30 A.M.

Breakfast for the ladies at the J. L. Hudson Company store. Special features of entertainment will be provided after breakfast.

### Morning—9:30 A.M.

Fifth Educational Session: Presiding, R. M. Wick, Vice-Chairman of the Research Directing Sub-Committee."

### Afternoon—2:00 P.M.

Annual business meeting of the Society in the Grand Ballroom of the Statler. Election of officers and selection of the 1948 Convention city to be made.

### Evening—7:00 P.M.

Annual banquet in the Grand Ballroom. Included will be dinner, entertainment, dancing and distribution of awards.



R. L. Redmond  
Chairman, Entertainment Committee



J. E. Bunch  
Chairman, Hotel Committee

## FRIDAY—JUNE 27

The entire day is provided to insure ample time for every visitor to the Convention to see the Industrial Finishing Exposition. In addition, plant visitations are scheduled for Friday. Among the various plants to be visited are the following:

Chevrolet Bumper Division, Detroit, Mich.

Cadillac Motor Division, Detroit, Mich.

Ford Motor Company, Detroit, Mich.

Fisher Body — Ternstedt Division, Detroit, Mich.

Pontiac Motor Division, Pontiac, Mich.

United States Rubber Company, Detroit, Mich.

Wyandotte Chemicals Corporation, Wyandotte, Mich.

Details as to time of departure and itinerary will be listed in the general program which is to be distributed upon registration.

## Educational Program

### First Educational Session

Monday Afternoon—June 23rd

2:00 P.M.

CHARLES L. FAUST, Chairman  
Battelle Memorial Institute

1. "Stress in Electrodeposits and its Significance"

By A. K. GRAHAM AND K. G. SODERBERG, Graham, Crowley and Associates.



B. C. Case  
Chairman, Program Committee



George A. Pillsbury  
Co-Chairman, Finance Committee



Frank L. Clifton  
Chairman, Registration Committee



C. L. Southwick  
Chairman, Transportation Committee

2. "Stress in Electrodeposited Nickel"  
By WM. M. PHILLIPS AND F. L. CLIFTON, General Motors Corporation, Research Division.
3. "Physical Properties of Electrodeposited Chromium"  
By ABNER BRENNER, POLLY BURKHEAD AND CHARLES W. JENNINGS, U. S. Bureau of Standards.
4. "Bright Brass Plating of Zinc Base Die Castings"  
By STANLEY J. BEYER, Hart Manufacturing Company.

### Second Educational Session Tuesday Morning—June 24th 9:30 A.M.

- FLOYD OPLINGER, Chairman  
*E. I. du Pont de Nemours & Co., Inc.*
1. "Modern Applications of Electroplating Solution Purification"  
By B. C. CASE, Hanson-Van Winkle-Munning Company.
  2. "Electroforming Pitot Static Tubes"  
By ALFRED S. KASDAN, Kollsman Instrument Division of Square D Company.
  3. "Chemical Deposition of Nickel and Cobalt"  
By ABNER BRENNER AND GRACE RIDDELL, U. S. Bureau of Standards.
  4. "Recent Developments in the use of Conversion Coatings on Zinc"  
By J. E. STARECK AND W. S. CIBULSKIS, United Chromium Corporation.
  5. "Bulk Nickel Plating"  
By HENRY STROW, MacDermid, Inc.

### Third Educational Session Wednesday Morning—June 25th 9:30 A.M.

- ARTHUR McNEIL, Chairman  
*MacDermid, Inc.*
1. "Manufacturing Process for Standard Sixty Inch Reflectors"  
Sound film in color by the Engineering Board of Fort Belvoir, Virginia.
  2. "Barrel Chromium Plating"  
By GEORGE DUBPERNELL AND S. M. MARTIN, United Chromium Corporation.
  3. "Health Hazards in the Electroplating Industry"  
By J. E. MOLOS, Industrial Hygiene Engineer, City of St. Louis, Missouri.
  4. "Standardization of Buffing for Preparation of Atmospheric Exposure Test Panels"  
By C. C. CUPPS, Standard Steel Spring Company and A. K. GRAHAM, Graham, Crowley and Associates.
  5. "Evaluation of the Buffability of Nickel Deposits"  
By R. D. MILLER, Bumper Division, Electric Auto-Lite Corporation and A. H. DuROSE, Harshaw Chemical Company.



Henry J. Bock  
Chairman, Job-Shop Committee



C. R. Beaubien  
Chairman, Plant Visitation Committee



Frank Watt  
Chairman, Publicity Committee



**Fourth Educational Session**  
**Wednesday Afternoon—**  
**June 25th**  
**2:30 P.M.**

**E. T. CANDEE**  
*Chairman, Research Committee*

1. **Project No. 2, "Extraction Methods Applied to Electroplating Baths—Determination of Zinc and Other Impurities in Nickel Plating Solutions"**  
*By E. J. SERFASS, Lehigh University.*
2. **Project No. 4, "The Effect of Surface Finish on Non-Ferrous Base Metals on Protective Value of Plated Coatings"**  
*By GEORGE I. KAHAN, U. S. Time Corporation.*
3. **Project No. 5, "Some Effects of Copper in Nickel Plating Solutions"**  
*By D. T. EWING, Michigan State College.*
4. **Project No. 6, "Protective Power of Electrodeposits"**  
*By N. THON, Princeton University.*

**Fifth Educational Session**  
**Thursday Morning—June 26th**  
**9:30 A.M.**

**R. M. Wick, Vice-Chairman**  
*Research Directing Sub-Committee*

1. **Project No. 7, "The Evaluation of Methods for Determining the Thickness of Electrodeposited Coatings"**  
*By HAROLD J. REED, Pennsylvania State College.*
2. **Project No. 8, "General Considerations of Experimental Methods for Determining Polarization"**  
*By ALFRED L. FERGUSON, University of Michigan.*
3. **Project No. 9, "Physical Properties of Electrodeposited Metal"**  
*By ABNER BRENNER, National Bureau of Standards.*
4. **Project No. 10, "The Present Status of Plating Room Waste Disposal"**  
*By B. F. DODGE AND D. C. REAMS, Yale University.*



Hotel Statler, Detroit,  
 Convention Headquarters

*Ladies Program*



**Mrs. George A. Pillsbury**  
*Chairlady, Women's Committee*

The women's committee of the Annual Convention of the American Electroplaters' Society is composed of *Mrs. George A. Pillsbury*, Chairlady, *Mrs. G. L. Nankervis*, *Mrs. C. E. Heussner*, *Mrs. Walter L. Pinner*, *Mrs. W. W. Wilson*, *Mrs. C. F. Nixon*, *Mrs. Howard Knight* and *Mrs. O. H. Leidy*. The following program has been planned for the ladies:

**SUNDAY—JUNE 22**  
**Afternoon—3:00 P.M.**

Registration on the ballroom floor of the Hotel Statler.

**MONDAY—JUNE 23**  
**Morning—10:00 A.M.**

Trip through Greenfield Village with luncheon at the Dearborn Inn. Buses will leave Bagley Street entrance of the Hotel Statler starting at 10:00 o'clock. A conducted tour lasting two hours through famous Greenfield Village will start upon arrival. The ladies will be taken by bus to the Dearborn Inn for a 1:30 P.M. luncheon. Extensive plans have been made for making this trip most enjoyable. Return trip by bus to the Hotel from Dearborn Inn will start at 4:00 o'clock in the afternoon.

**TUESDAY—JUNE 24**  
**Morning—8:30 A.M.**

Arrangements have been made for

the ladies to enjoy a broadcast directly in the studio. The ladies should plan to be at the WWJ broadcasting studio in the WWJ Building, 630 W. Lafayette Blvd. by 8:30 A.M. for a special broadcast of the WWJ "Coffee Club" program. Special features on the program will be connected with the Convention.

**WEDNESDAY—JUNE 25**  
**Morning—11:30 A.M.**

Buses will leave the Bagley Street entrance of the Hotel Statler starting at 11:30 for a trip around Belle Isle and to the Detroit Yacht Club. Here the ladies will be royally entertained with music, luncheon, entertainment features, prizes and an all-around good time. The hosts will be the *Wyandotte Chemical Corporation*—everything will be gratis. Buses will start the return trip at approximately 5 o'clock in the evening.

**THURSDAY—JUNE 26**  
**Morning—8:30 A.M.**

Breakfast has been arranged at the J. L. Hudson Company store where a fashion show is to take place for the benefit of the ladies. An extensive program is prepared in addition. Time will be allowed in the latter part of the morning for going through the store.

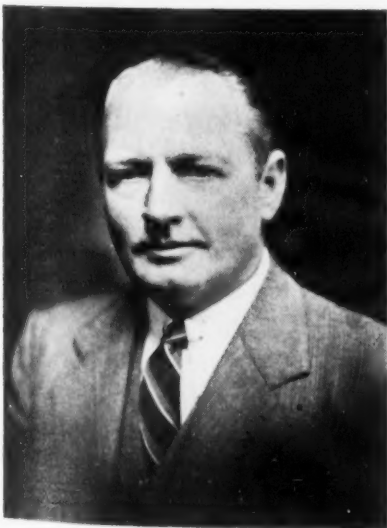




W. Douglas MacDermid  
Chairman



Robert W. Renton  
First Vice-Chairman



Louis M. Hague  
Second Vice-Chairman



T. A. Trumbour  
Permanent Secretary



Joe Duffy  
Chairman, Golf Committee

## International Fellowship Club

The International Fellowship Club expects to play an important part in entertaining the registrants, as it has in the past. The group is composed of suppliers to the finishing field, who stand all expenses of the club.

The activities of the International Fellowship Club during the Convention and Exposition are as follows:

### MONDAY—JUNE 23

#### Noon—12:30 P.M.

The Annual Luncheon of the club will be held in the Michigan Room of the Hotel Statler at 12:30 P.M. This luncheon is exclusively for manufacturers, suppliers and their representatives. Inasmuch as the first educational session will not start until 2:00 o'clock, ample time will be available to transact the business of the annual meeting. The order of business will be luncheon, guest speaker, election of officers and discussion of arrangements for the various activities sponsored by the club during the week.

#### Evening—8:30 P.M.

Open House will be held in the Grand Ballroom of the Statler. All registrants to the Convention are urged to attend the annual Open House function, which is provided by the liberal

contributions of firms selling to the industry. The purpose of this outstanding entertainment feature is to offer an opportunity for all registrants to become acquainted, as well as to create goodwill in the plating and finishing industry.

Gratuities to the waiter are taken care of by the club. The program will include music by an excellent orchestra, dancing and refreshments.

### TUESDAY—JUNE 24

#### Noon—12:30 P.M.

A golf tournament has been arranged for all registrants under the chairmanship of Joe Duffy. Buses will leave the Bagley Street entrance of the Statler starting at 12:30 P.M. for the Western Golf Club where the tournament, sponsored by the club, will be held. If time is short, luncheon will be available at the golf club. Prizes, plenty of competition and a good time for everyone is assured. A form is included with the registration booklet to be filled out if participation in the golf tournament is desired by the registrant.

*The International Fellowship Club extends a cordial invitation to enjoy fellowship features during the Convention.*



Convention Hall, Detroit, Industrial Finishing Exposition Headquarters

# Industrial Finishing Exposition

In Convention Hall, Detroit, the first exhibition of equipments, materials, services, processes and plated products will be given by the American Electroplaters' Society in eleven years. The Exposition will be held June 23-27 in conjunction with the Annual Convention of the A.E.S. Over a hundred manufacturers and suppliers will be represented in spacious Convention Hall.

The customary Branch Exhibits and Individual Exhibits of the A. E. S. will be housed in the Hotel Statler, where the Convention is being held.

To supplement the educational value of the Exposition, all visitors are urged to utilize the Hooker Kresge Library, located at Wayne University. The library is said to be the most complete collection of books and periodicals pertaining to plating in the country.

Attending the Industrial Finishing Exposition will be A.E.S. members, process engineers and technicians and all operating engineers and executives interested in the latest developments of the complete metal finishing industry.

Of interest to all will be a completely equipped plating installation where souvenirs will be plated before the eyes of the visitor. Full scale plant equipment and operating conditions will be

used, illustrating general plating practice.

Fully automatic and semi-automatic plating equipment will be exhibited in many booths, with the equipment in full operation. Attendants will explain the more complex details and visitors are requested to ask as many questions as they desire to fully understand the operations.

Among accessory equipment and process exhibits will be complete representation of the filter, de-ionization and heat exchanger fields. Tanks, tank linings, racks and rack coatings will be fully displayed with detailed cross-sectional samples.

Degreasers, cleaners and equipment for their use will be amply covered by various cleverly arranged exhibits. Specialized cleaners and degreasers will be illustrated as well.

The polishing and buffing equipment field will be thoroughly covered. Automatic equipment, standard buffing and polishing lathes, backstand idler and abrasive belt equipment are some of score of this type of exhibit. Buffs and various types of wheels as well as abrasive belts will be shown in conjunction with equipment. Special emphasis will be laid on the application of buffing compounds, a complete cross-

sectional picture of the various mechanical or hand methods of application being shown.

Electrical equipment manufacturers will be well represented; rheostats, bus bars, motor-generators and rectifiers being some of the better-known products to be exhibited. In generator or rectifier control, current-reversal or current-interruption has received much attention recently; this will be one of the features of a display which will also include recent developments in temperature, automatic fluid or solution level controls.

The largest plating installation in the world will be graphically illustrated in one important display. The complete operation of this huge automatic plant will be shown in mural-style photographs and charts.

Achievements in chemical baths, particularly copper and nickel, will be covered as will rust proofing solutions and methods of application.

## LIST OF EXHIBITORS

Exhibitor	Booth Nos.
Acme Manufacturing Co., Detroit, Mich.	39, 40
Advance Plating Co., Inc., Detroit, Mich.	256, 257
Advance Polishing Wheels, Inc., (Matchless Metal Polish Co.), Chicago, Ill.	276
Aget-Detroit Co., Ann Arbor, Mich.	84

Alsop Engineering Corp., *Milldale, Conn.* 248  
 Aluminum Co. of America, *Pittsburgh, Pa.* 223, 224  
 American Buff Co., *Chicago, Ill.* 340  
 American Instrument Co., *Silver Spring, Md.* 316  
 American Rolling Mills, *Middletown, Ohio* 221, 222  
 Auto City Plating Co., *Detroit, Mich.* 61  
 Automotive Rubber Co., Inc., *Detroit, Mich.* 249, 250  
 Bart-Messing Corp., *New York, N. Y.* 261  
 Barwin Company, *Oronoke, Conn.* 19  
 Bracon Wiper Supply Co., *Chelsea, Mass.* 373  
 Behr-Manning Corp., *Troy, N. Y.* 317, 318  
 Belke Mfg. Co., *Chicago, Ill.* 24, 25  
 G. S. Blakeslee & Co., *Cicero, Ill.* 382  
 Bruce Products Corp., *Detroit, Mich.* 277  
 Buckeye Products Co., *Cincinnati, Ohio* 336  
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 Dunn Products, *Chicago, Ill.* 266  
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 Eaton-Clark Co., *Detroit, Mich.* 337  
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 Electric Products Co., *Cleveland, Ohio* 121, 122  
 Electro-Tech Equipment Co., *New York, N. Y.* 264, 265  
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Formax Mfg. Co., *Detroit, Mich.* 244, 245  
 Fulton Syphon Co., *Detroit, Mich.* 366  
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 General Chemical Co., *New York, N. Y.* 371  
 General Electric Co., *Bridgeport, Conn.* 280, 281  
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 W. Green Electric Co., Inc., *New York, N. Y.* 50  
 Frederick Gumm Chemical Co., Inc., *Kearny, N. J.* 20, 21  
 Hammond Machinery Builders, Inc., *Kalamazoo, Mich.* 65, 66, 67, 68  
 Hanson-Van Winkle-Munning Co., *Matawan, N. J.* 201  
 Harding Manufacturing Co., Inc., *Detroit, Mich.* 10  
 Harshaw Chemical Co., *Cleveland, Ohio* 350, 351, 352  
 Haveg Corp., *Newark, Del.* 296  
 Heil Process Equipment Corp., *Cleveland, Ohio* 361  
 Houdaille-Hershey Corp., *Detroit, Mich.* 93  
 M. P. Iding Disc Grinding Compound Co., Inc., *Milwaukee, Wis.* 325  
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# Engineering Applications of Electrodeposited Coatings

By Myron B. Diggin, Technical Director, Hanson-Van Winkle-Munning Company, Matawan, N. J.

EVERYONE is familiar with electroplated coatings used for decorative and protective purposes, as there is hardly a consumer's article that is not, at least in part, plated. Automobile bumper bars, door handles, trim, nuts, bolts, washers and fasteners, washing machines, toasters, vacuum cleaners, screen hardware, chairs, bus and rail seats, plumbing goods, kitchen tools, flatware, toys, telephones, meters, lamps, stoves, cameras, typewriters, business machines, surgical instruments and caskets are made attractive and more serviceable by the use of plated coatings. Indeed, it is impossible for an individual to pass a single day without touching or using thousands of electroplated articles. The extent to which electrodeposited coatings are used for purposes other than decoration and protection is not appreciated by the average person or even by many technical men and engineers.

Electroplated coatings are used for engineering purposes because they impart to the metal or non-metal being plated certain physical properties not possessed by the base material. In most cases the properties of both the base and the plated coatings are necessary for the proper functioning of the device. In other cases, the combination is chosen because of economic considerations. It is significant that electrodeposition is used in preference to pyrometallurgical methods for many applications, not because of relative ease of application, but because of (1) the physical properties of metals can be varied over wider limits in the electrodeposited form and (2) the physical properties can, in most cases, be controlled more closely. This will be illustrated by some examples which we shall discuss later.

## Chromium Plating

The average individual associates chromium plating with automobile trim, modernistic cocktail bars, bathroom fixtures and gadgets. He does not realize the role chromium plating played in winning the war, and to what extent it is contributing to our industrial life today. Pure chromium metal is extremely hard and brittle. A hammer blow will easily rupture a solid bar of chromium. When this hard metal is applied by electrodeposition to softer metals, however, it imparts surface hardness, abrasion resistance and low co-efficient of friction which multiplies the service life of the device tremendously. The actual hardness of plated chromium varies between 580 and 1025 Brinell. The reflection factor varies from 60% to

66%. Several investigators have reported that chromium has the lowest co-efficient of friction available in any of the structural metals.

Chromium deposits are applied to all type of tools, such as dies, reamers, drills, saws, milling cutters, burnishing tools, files and similar articles to increase their life, to increase machining speed, and to produce better products. For example, in one plant a broach ten inches long and one and one-quarter inches square is used to machine generator brush holders. At the beginning of the war, the hardened and sharpened broaches in the unplated condition could be used for only 1200-1400 cuts. They could be sharpened only once and then used for an additional 1200 cuts before losing dimensional tolerances. The application of as little as .0005" of chromium to the new broach increased the number of cuts initially to 3200. At this point, the broaches are stripped of chromium in an alkaline solution, resharpened, replated and then used for an additional 3200 cuts. This process can be repeated thrice before the tolerances are lost. The procedure saved time in tool changing, but what was more important during the war period, it conserved hard-to-replace tools. When a few one-hundred-thousandths of chromium is applied to twist drills and files the life of the tool is greatly increased and cleaner work is produced, especially when drilling or filing softer metals or plastics.

Chromium coatings are used on pump shafts to resist abrasion of packing material and on torpedo propeller shafts to reduce friction and wear and incidentally, to increase accuracy.

One of the largest chromium plating plants in the world was erected during the war for plating piston rings used in aircraft engines. In this case, the chromium is given a short anodic treatment, after cathodic deposition, to develop microscopic cracks in the surface. This treatment, which is known as "Porous Chrome," increases lubricating oil retention. The success of our aircraft during the North African campaign was in a large part a result of using Porous Chrome piston rings. It was found that ordinary rings would fail after a 6 or 8 hour flight. Replacing these rings with Porous Chrome plated rings extended the flight time to as long as 90 hours in the same geographical area which, in those dusty and motor-wrecking areas, enabled planes to stay in service at least six times longer without an overhaul. Porous Chrome was also applied to recondition and build back to dimensions worn aircraft cylinders. Peace



time applications include the plating of cylinder liners of internal combustion engines.

It was found during the war that 50 caliber machine gun barrels wore out too rapidly at ever increasing rates-of-fire. Chromium plating the inside of the barrels not only extended the life of new barrels, but made possible the economical salvage of worn barrels.

Chromium deposits are also used for bottle molds, plastic molds, pellet molds, for building-up mismachined parts and for facing stereotypes, electrotypes and phonograph stampers. Rolls for cold-rolling metals to a high luster, calendar rolls for various materials and drying drums used in the chemical industries are other examples of common uses.

### **Nickel Plating**

Nickel coatings have been used for many years for purposes other than decoration or protection. Today, our better knowledge of the electrodeposition process, especially in respect to the control of physical properties of deposits, has brought about many new applications.

In the manufacture of phonograph records, the original recording is made on wax, which would be useless for molding shellac or vinyl-base records. To produce a usable stamper, the wax is gold-sputtered, plated with a heavy copper and then nickel-faced. The nickel surface of this master is then made passive with dichromate and plated with nickel and backed up with copper. After separating the two nickel faces at the passive juncture, the mold can be used for making additional masters and molds. These, in turn, are passivated and again plated with nickel and copper and backed-up with a heavier metal for stiffness. This is called a "stamper" and is used on a press to make records. In some cases, the stampers are chromium plated to increase wear-resistance. This process, while old, is one of the most fascinating in the field of electrodeposition as each resonant note of a French horn or the delicate tone of a violin in a symphony orchestra must preserve its identity and fidelity through these multiple plating operations.

Nickel deposits are used universally for facing soft lead-base stereotype metals for printing newspapers and magazines. During the war period, inks were more corrosive and domestic clay fillers in paper, more abrasive. The usual thickness of about .001" of nickel would not withstand the press runs required. Applying heavier thicknesses caused the delicate dots in half-tones illustrations to "mushroom" with a consequent loss in detail and blocking of tones. Here the electrochemist was able to save the situation by developing a nickel process which produced harder and more abrasion-resistant coatings, which at the same time, gave greater fidelity and shorter processing time.

Nickel deposits are also used on electrotypes from which books and magazines are printed, and on etched copper rolls for printing designs on fabrics. An expanding use for nickel deposits is the building-up of worn or mismachined parts. This practice has been in widespread use in England for some years. Its advantages are now being realized in this country.

The deposition of nickel is used for electroforming

parabolic mirrors, strainers, screens, hypodermic needles, molds and many other articles which are difficult or expensive to fabricate or finish by conventional methods. Nickel is used as a bonding layer in the cladding of dissimilar metals and in the production of silver aircraft bearings which will be discussed later.

Nickel plated steel wire was used as a substitute for solid nickel alloy wire during the war, for lead-in wire in electric light bulbs, thus saving many tons of this vital metal for other war uses.

Another interesting application of nickel is its use as a cement in the manufacture of small diamond abrasive wheels. The diamond chips are held in place on the surface of the wheel and nickel deposited around them so that they are partially surrounded and held in place by the nickel deposit.

Nickel lined steel pipe is now being produced for the chemical industries. Nickel is electrolytically deposited on the inside wall of the pipe in thicknesses of from .005" to .100". Pipe sizes handled can be up to 20 feet long and from 2" to 8" inside diameter. The adhesion of the bond between nickel and steel is excellent; it is not ruptured during heating, bending, or even under the tremendous stress and change undergone during a reduction.

### **Iron Plating**

Electrodeposited iron is used primarily for building-up worn and mismachined parts and for the production of molds. A novel use is the plating of soldering iron tips fabricated from copper. The iron layer prevents erosion of the underlying copper.

### **Copper Plating**

Copper electrodeposits are also used in place of, or in conjunction with nickel in many of the applications referred to above. For example, electrotypes and record stampers are faced with nickel and backed-up with copper. Copper is also used in bonding dissimilar metals. Applied to aluminum or other metals that do not solder easily, a tight soft-solder joint can be made. Plastics which have troublesome moisture absorption characteristics can be sealed and at the same time made stronger and more abrasion resistant by encasing them in an electrodeposited shell. During the war, steatite crystal cases were selectively plated with copper, after first metallizing the selected areas with chemically reduced films of silver. The two halves of the cases, and the prong pins could then be soft soldered to form a hermetic seal. A similar procedure was used on both ends of glass tubes containing resistors so that a metal-to-metal seal could be made between the glass and the metal caps.

Copper is deposited on steel rolls for rotogravure printing. The deposit applied is about .006" thick. The copper is honed to a smooth finish, and exposed sensitized tissue applied and the delicate design etched on the surface with ferric chloride. After the press run, the shell is stripped from the roll, replated and the process repeated.

Electrosheet copper is produced in a large copper refinery in standard widths. The copper sulfate solu-

tion used in refining is diverted to tanks in which a lead drum is rotated. The copper plated on the drum is drawn off in the form of a continuous sheet. Weights of 1 oz./sq. ft. to 10 oz./sq. ft. can be produced by varying either the speed of the drum or the current density.

Fine screens, clock faces, plumbing fittings, molds, toilet float balls, caskets, pencil sheaths and numerous other articles are commonly produced by electroforming with copper. It is not generally known that kettle drums, horns such as trombones, French horns, etc., are now made by electroforming with improved tone over fabrication by mechanical methods.

The good heat conducting properties of copper is utilized in coating the bottoms of various kinds of cooking utensils. Similarly, the high electrical conductivity of copper was utilized during the war as a coating for radio transmitter chassis and frames and also radio antennae, all of which were fabricated from steel. An interesting use for copper is its application by electrodeposition to iron magnets used in domestic watt-hour meters. Lightning surges are carried through the conductive copper and grounded. Without this coating, severe damage to the instruments might occur.

Copper deposits are used extensively for coating steel and stainless steel wire which is to be drawn through dies for diameter reduction. Steel, and especially chromium and nickel-chromium steels, in the uncoated conditions, would cause abnormal wear of the dies. Thin copper coatings act as a lubricant and not only greatly prolong die life but also lead to the production of smoother surfaces on the wire.

A considerable amount of copper is plated on articles that are to be selectively carburized, such as gears, shafts, cams, etc., where a hard and wear-resisting surface is required on certain areas and the remaining areas must remain soft. Protection against hardening is afforded by plating selected areas with approximately .001" of copper, which prevents the carburizing gases or compounds from reacting with the surface of the steel.

Electrodeposition is used for the production of copper and other metallic powders used in the powder metallurgy process and as pigments in paints. In this case, a solid compact and continuous deposit is not wanted at the cathode. The manufacture of copper powders by electrolysis was given impetus during the war for use in anti-fouling paints for ship hulls.

### **Tin Plating**

Tin coatings, or a copper-tin alloy deposit, are similarly used for protecting selected areas during nitrating operations. Another engineering application of tin is the plating of cast iron pistons for automobile engines. The soft tin deposit flows under pressure to accommodate irregularities in the cylinder wall and thus prevents scuffing during the breaking-in period.

### **Precious Metals Plating**

Silver, rhodium and copper-tin-zinc (albaloy) electrodeposits are used for coating reflectors made of

materials having low light reflective properties. The latter two metals are particularly useful because of their high tarnish resistance. Albaloy and tin deposits are applied to metal components to be soft soldered where only non-corrosive rosin-base fluxes are permitted.

Silver, albaloy and, to some extent, gold electrodeposits are used on ultra-high radio frequency devices such as radar equipment, because of good electrical conducting properties combined with corrosion resisting qualities.

One of the most remarkable developments during the war period was the use of electrodeposited silver bearings in aircraft engines. Conventional lead-bearing copper alloys would not stand up under exceptionally heavy loads imposed upon them. Bearing materials are usually bonded to a steel backing. Because of the engineer's inability to provide a completely stiff support for the bearing shell, it is continually under flexure caused by the bearing load during operation. This flexure causes shearing stresses in the bond layer. When increasing loads are applied to tin-lead alloys bonded to steel, their failure is caused by lead dendrites spreading and, in some cases, constituting the entire bonding layer, thus providing a bonding material of extremely low strength. Many metals and alloys were tried in an attempt to find a solution to this problem. Silver was chosen for the main structure of the bearing layer proper because of its mechanical strength, ease of application and machining, and reasonable bearing metal properties. Silver cast upon steel was not satisfactory because of its non-uniform coarse structure and because of difficulties in bonding. The structure of electroplated silver is easily controlled. Silver alone, however, had two disadvantages: (1) lack of oil wet-ability, (2) an excess of hardness. It was found that the application of approximately .001" of lead on the surface of the silver bearing would provide the necessary bearing quality; namely, a surface which not only has high oil film-retaining characteristics, but which also has the ability to prevent seizing during periods of operation when the oil film may be temporarily destroyed. By making this lead film sufficiently thin so that it does not have to have an inherent strength, the softness of the bearing surface can be maintained and all of the qualities of lead as the ideal bearing material can also be retained. It was found that organic acids present in petroleum products corroded the thin lead surface. This defect was overcome, depositing indium over the lead and then alloying it with the lead by heat treatment to form a 4% indium-lead alloy. This minimized corrosion and protected the lead surface. The complete bearing, therefore, consists of a steel backing, a thin flash of electrodeposited nickel to serve as a bonding material between the steel and silver, an electrodeposited silver layer of approximately .020", an electrodeposited lead coating of .001" and finally, the application of about 4 mg./sq. inch of indium, which is diffused into the lead, forming a 4% lead indium alloy. Incidentally, the 4% lead indium alloy, has a hardness of approximately 17 Brinell, whereas, indium alone has a Brinell hardness of less than 3.

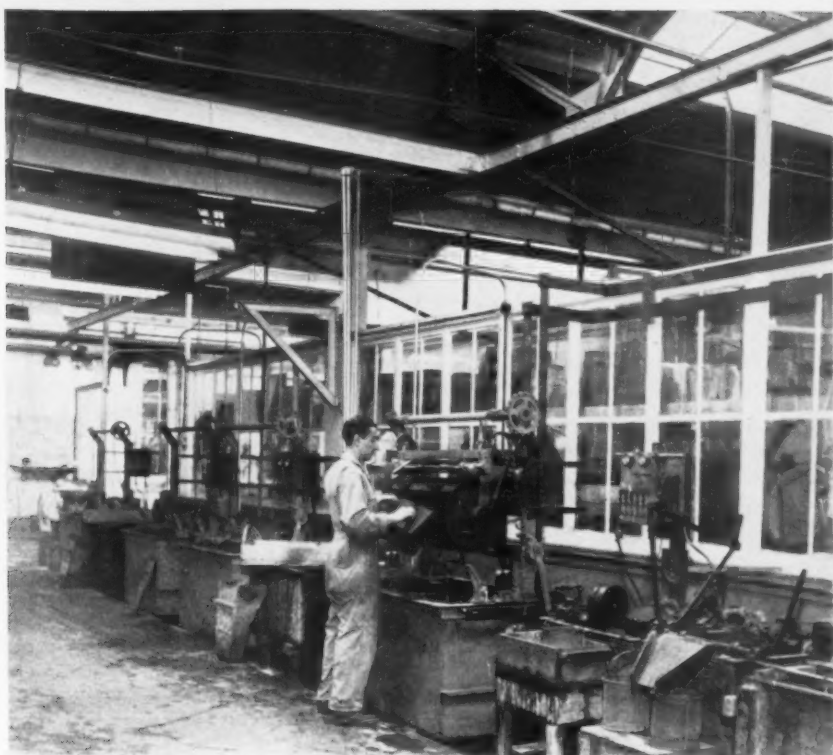


Figure 1. Nickel plating section. Note the horizontal barrel with chain lift in center. Different styles of oblique barrels are also used.

## Barrel Plated Multiple Coatings

By Mario Mazzone and Floyd McKnight

A **S**IZABLE portion of all the metal toy railroad parts made by a leading toy train manufacturer\* are electroplated, the major exceptions being the actual car bodies, which are painted. All accessory parts receive platings of copper, nickel, chromium, zinc, silver or cadmium, or are black-oxidized in the plating department.

For purposes of this article, barrel plating alone is treated. This firm was one of the first companies in the United States to utilize barrel chromium plating, and still earlier, the company led in other types of barrel plating. More than 80 per cent of its plating is now done in revolving barrels.

The tremendous value of barrel plating for the toy railroad manufacturer lies, of course, in the adaptability of the method to the coating of great numbers of small pieces—a value recognized also by bearing manufacturers and others who have utilized the technique in both war and peace.

The barrels are mostly of hard rubber, synthetic rubber or laminated resin for zinc, nickel, cyanide copper and silver plating operations; the chromium plating barrel is of a special structure, discussed in due course. For the plating operation, the barrels have to be hoisted in each instance and lowered into the appropriate tank. The tanks for cyanide zinc,

cadmium and copper plating are of steel, and those for nickel and silver plating are of steel rubber-lined.

Generally speaking, the set-up consists of a barrel, a hoist, a plating tank and two rinse tanks. Current for all electroplating solutions originates in a special power room, air-conditioned and equipped to keep out all dust and fumes whose presence would tend to corrode the generators. One generator with a current of 2,000 amperes provides the power for the chromium plating apparatus. There are five 500-ampere generators, each of which furnishes power for one of the plating cycles. Two 500-ampere copper oxide rectifiers provide the current for nickel plating operations.

The barrels themselves are insulated; with the single exception of the chromium plating cycle, the current passes into them through flexible dangles which act as negative electrodes and at the same time frequently helps to keep the toy railroad parts being plated from piling up on one another to the detriment of the plating operation. The anodes, or positive electrodes, with the exception of chromium, are of the metal which is to be electrodeposited, and more than 99 per cent pure. The entire mechanism in the cylinder—driving gears, the barrel itself, the motor (situated outside) and the anodes—is insulated from the tank.

Ultimate use of a specific toy railroad part and the conditions to which it will be subjected always de-

\*Lionel Corporation, Irvington, N. J.



termine selection of the type of plating to be deposited on it. Steel driving-rods are bright nickel-plated for lustre and appearance. Steel relay side pieces are zinc-plated because of the corrosion-resistant and soldering qualities of zinc. Copper plating is applied to a steel heating lamp holder which serves as a smoke generator, and on top of the copper coating a silver plating is added to increase corrosion-resistance. Copper brushes, used as an electric contact in locomotives, are silver-plated because of the electrical conductivity of silver. Rail ties are black-oxidized to furnish a contrasting color to the track, as well as enhance corrosion-resistance properties. Some axles are black-oxidized; some are nickel-plated. Die-cast toy railroad parts are either black-nickel or nicked.

A typical piece which will perhaps serve better than any other to depict the electroplating process by the revolving barrel technique in this plant is the steel plunger, a part about  $1\frac{1}{4}$ " long,  $\frac{1}{4}$ " diameter, cylindrical in shape, which acts as a magnet in the relay unit. This single plunger receives three electro-coatings—one each of copper, nickel and chromium.

Following this single part through its electroplating journey, the observer may discern in a sound, practical way the functions and processes of these three types of coatings: first of all, copper, for complete coverage and to increase corrosion-resistance; nickel, to add to the corrosion-resistance properties of the coating and to provide a bright base for the chromium coat to come; and chromium, for wear-resistance, smoothness and brightness.

### Copper Plating

In actual use, this single plunger has to undergo tremendous wear-and-tear. Hence the three electro-deposits. The operator applies the first coating—the copper plating—from a copper cyanide bath, which imparts to the steel part a copper deposit having a

tight grain structure which provides a less porous surface than that furnished by nickel or chromium alone. Simply because the copper coating is the least porous, it makes possible a more perfect coverage.

For plating, the operator lowers the barrel into the bath, then loads it—an oblique barrel for smaller lots of work or a horizontal one for larger lots—into a tank of mild steel, the source of heat for which is a system of steam coils. The anodes are of pure rolled annealed copper. The copper is deposited from a conventional copper cyanide solution of the following concentration:

Copper cyanide	3.5 ounces per gallon
Sodium cyanide	4.5 " " "
Free cyanide	1.3 " " "
Sodium carbonate	2. " " "

Temperature	105 degrees Fahrenheit
Current density	Depends on size of part and weight of load; varies from 15 to 40 amperes per load
E.M.F.	3.5-5 volts
Time	For plunger, 20 to 30 minutes

The copper plating finished, the operator quickly removes the load of copper-plated steel plungers from the barrel and gives them a cold water rinse to remove the cyanide adhering to them. There follows a second cold water rinse.

### Nickel Plating

The plungers now pass to the nickel-plating bath, for which the firm employs barrels of a similar type. For ordinary commercial nickel-plating there are three types of baths, although still others are used in certain instances. The three most popular types are the nickel-sulphate, better known as single-nickel salt bath, advantageous because of the greater solubility it provides; the double-nickel salt bath, or nickel-ammonium-sulphate, ordinarily regarded as especially adaptable to barrel plating in which low cathode current density is used to give a thin plating; and a nickel-chloride bath.

The single-nickel salt bath is utilized for barrel plating, introducing it in conjunction with ammonium-chloride and boric acid. The ammonium-chloride addition furnishes an ammonium-ion which will form a nickel complex. The chloride increases the corrosion of the nickel anodes. The boric acid serves as a buffer to prevent great variations of pH and also makes for a whiter deposit. The increase in metal-ion content also increases the current density of the solution. The suggested concentration of the solution for barrel plating is as follows:

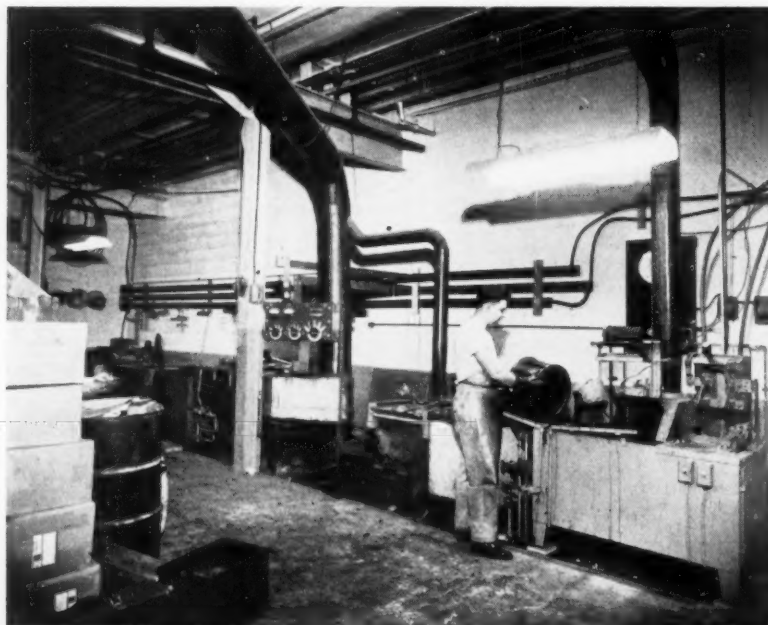


Figure 2. Chromium plating. Barrel equipment in foreground, still tank set-up at left.



Nickel sulphate	20 ounces per gallon
Ammonium chloride	4 ounces per gallon
Boric acid	4 " " "
pH	6.5 " " "

Operating conditions are:

Current density (for 50-pound load)	From 45 to 150 amperes per load
E.M.F.	5-6 volts
Temp.	Approximately 90 degrees Fahrenheit
Time	45 minutes for the plunger; it is governed in the case of each part by the thickness of deposit desired

For nickel plating, the barrel is insulated from the tank. The flexible dangles act as negative electrodes and the rolled depolarized curved nickel anodes, suspended from copper bus-bars, are more than 99 per cent pure nickel. Impurities from the anodes or in the solution itself tend to migrate and redeposit on the surface of the parts being plated, creating pitting or dark spots. To prevent such spotting or pitting, a periodic filtering of the solution is necessary. It is also best to cover the anodes with anode-bags.

Sometimes, to increase the brightness of the electrodeposit, an inorganic salt such as cadmium chloride or cobalt chloride or sulphate is added to the solution as a brightening agent. Such additions must always be carefully measured. An excess will result in a hardening of the nickel deposit and cause brittleness. The amount of such additions varies with the volume of the solution, or tank capacity. In a hot solution, in which greater current density and a high metal content are required to produce a brighter finish, a smaller addition of such brightening agent, or perhaps none at all, is needed.

After nickel plating, the load of plungers is removed—to follow through with this typical triple-coated item—then washed in two cold water rinses, given a quick hydrochloric acid dip, then twice more rinsed in cold water. The entire nickel cycle, including the rinsing operations, is handled by a single operator. The rinse tanks are situated between the barrel plating tanks so that one rinsing unit serves the plating operations on either side of it. In the equipment shown in Figure 1, provisions are made for two cold rinses. For an additional hot rinse the work goes to a hot water tank situated near a centrifugal drier. Sometimes, after the hot rinse, the parts are tumbled in sawdust or granulated corncob for drying. After the rinses, the locomotive plungers need only a quick dipping to activate their surfaces preparatory to chromium plating. A good dip for this purpose is



Fig. 3. Zinc plating operation showing different types of barrels—auxiliary oblique barrels in foreground, horizontal barrels in background.

a 5 per cent hydrochloric acid solution. The acid removes a thin film that might have formed after the rinses, and facilitates plating. There then must follow a thorough rinse to remove every possible trace of the hydrochloric acid. Otherwise chlorides may find their way into the chromium plating bath and exert a poisoning effect upon it.

### Chromium Plating

Chromium plating, for which the locomotive plungers are now ready, represents a relatively new development in barrel plating science.

For chromium plating, the firm has both barrel and still tank equipment. For larger pieces the company uses the still tank chromium plating technique. It has satisfactory equipment for both types; but for purposes of this article the authors are treating only barrel plating. The two methods are similar in many respects, notably in the fact that too little current produces lack of coverage and too much current causes burning. A piece difficult to barrel nickel-plate would be still more difficult to barrel chromium-plate.

Barrel chromium-plating also resembles other types of barrel plating. The same types, sizes and shapes of work are adaptable. The pieces should be of such shape as to tumble freely and not interlock with one another. Small ball-shaped parts of steel, brass, copper and nickel-silver have been satisfactorily barrel plated with chromium. Small pieces, such as screws and circular parts, are particularly adapted to the barrel method—or any pieces which will not become clogged against the anode or cause a short circuit.

Unlike the barrels for other types of barrel plating, the 16-inch chromium plating barrel is of steel, coated on the outside with stop-off lacquer. The barrel's fins help break up the parts being plated. In working with chromic acid, the base of this plating solution,

whether in barrel or still tank plating, great pains are taken to protect the health of the platers by providing them rubber gloves, rubber aprons and goggles. The exhaust system is especially fine in the chromium plating unit, being designed to carry off every trace of detrimental fumes.

When the operator is thus equipped with his protective armor, he lowers the steel barrel into the plating solution, which is contained in a steel tank, lined with several layers of stop-off lacquer, over which have been applied resist sheets.

A notable feature of chromium plating is that the finished plating job, though exceptionally smooth and wear-resistant, is governed by the condition of the undercoat. A plater, may, to be sure, apply chromium directly upon steel, brass and copper, but the product would not stand up in service. It is preferable, because of the porosity of chromium plate, to give the parts a preliminary nickel deposit of from 0.0002" to 0.0003".

For loading, the operator places the barrel in position on the revolving shaft provided in the tank. The parts being plated—in this instance, the triple-coated plungers mentioned above—are emptied into the cylinder by means of a perforated scoop. Through the revolving shaft comes the electric current, which is transferred to the barrel by means of a belt-driven copper disc attached to the other end of the shaft and making contact with four copper brushes. The end of the drive shaft, which is part of the cathode, has to be kept lubricated with graphite grease to facilitate a satisfactory contact. The chromic acid in the solution also has to be kept very clean if the contact is not to be detrimentally affected. The anode, made of chemical lead, and which is situated above the tank and operated on a swivel, enters the barrel in a semi-circular downward swing, and plating be-

gins. Power for rotating the barrel at  $\frac{1}{2}$  r.p.m. is provided by a motor housed in a compartment next to the plating tank.

A mechanical agitator keeps the solution agitated, and the tank is equipped with an immersion heater, with arrangements for calibration of temperature. The temperature is held between 90 and 100 degrees Fahrenheit by means of a control apparatus situated behind the exhaust. Rheostat controls regulate the amperage and voltage.

The solution for barrel chrome plating is composed as follows:

Chromic acid	52.8 ounces per gallon
Catalyst	1.7 " " "

Operating conditions are as follows:

Current density	Maximum amperage
E.M.F.	10-15 volts
Temperature	90-100 degrees Fahrenheit
Baumé	31 degrees
Time	10 minutes (for plunger)

The chrome plating finished, the plungers now receive three water rinses, then a half-hour barrel burnishing in a soap solution designed to produce a lustrous finish. There follow three further rinses, two cold and one hot, then tumbling in sawdust until dry.

The locomotive plunger has now received the third of its three coatings—copper for coverage and corrosion-resistance, nickel for further corrosion-resistance and to supply a bright base for chromium, and chromium for better wear and for smoothness and brightness.

### Zinc Plating

Zinc plating, commercially developed in the last thirty years, is deposited directly upon steel, brass, copper or zinc die castings by means of a bright zinc-cyanide bath, a zinc-cyanide bath without any brightening agents or an acid bath containing zinc-sulphate salts. The firm uses the bright zinc-cyanide bath.

For the plating operation the tanks may be of mild steel or of rubber-lined steel. The barrel, constructed of perforated hard rubber, is equipped with flexible dangles which pass down the inside of the barrel and act as the negative electrode. These dangles are rubber-insulated all the way and exposed at the end to provide perfect contact. They serve, too, to help break up the pieces being plated, thereby keeping the parts from piling up in bunches and also to expose the surfaces to the electrolyte.

The sodium-cyanide content is very important. It should never exceed the zinc-cyanide content; a too

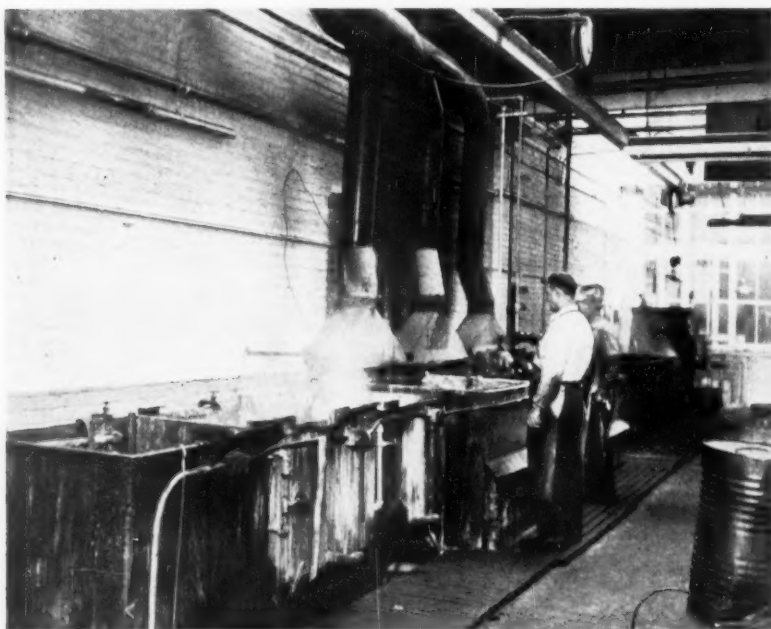


Figure 4. Black oxidizing section. The operator has immersed the big barrel for coating of the work. In this cycle the drive motor is situated on top of the barrel.

high carbonate concentration will diminish the throwing power of the solution. Especially in barrel zinc plating, a higher concentration of sodium hydroxide is essential.

Impurities which exert a poisoning influence upon the bath are most frequently traceable to the presence of copper, tin, lead, cadmium and arsenic. The anode bus-bars must be prevented from contaminating the solution when they are being cleaned—a purpose usually best effected by placing a tray underneath them to catch the minute particles of copper that may otherwise fall into the solution. Copper, representing the most difficult kind of contamination to prevent in the zinc-plating bath, is frequently introduced in the process of cleaning the bus-bars with sandpaper, and sometimes may be eliminated by the addition of zinc dust to the solution. Normally, one pound of zinc dust thrown on top of the bath will serve to displace the copper from it. Filtration on the following day, after the solution has stood all night with the zinc dust addition, will remove most of the impurities from the bath. In any event, the solution should be filtered weekly or monthly, depending upon frequency of use.

The other metal impurities—tin, lead, cadmium, arsenic, etc.—usually find their way into the bath through mere carelessness. Minute quantities of any of these impurities will cause a dark finish which is very difficult to bright dip. To remove these impurities, the plater may add sodium sulphide in small amounts to precipitate the undesirable substances as insoluble sulphides.

### Silver Plating

Silver plating, applied to steel, copper and brass parts when the plater so decides, is performed in a small oblique tilted perforated Bakelite barrel in a rubber-lined steel tank. The concentration of the solution for barrel plating is:

Silver cyanide	3.7	Troy ounces per gallon
Sodium cyanide	4.5-6	" " " "
Free cyanide	3.5-4	" " " "
Sodium carbonate	3-10	" " " "

Operating conditions are as follows:

Current density	Same as for copper cyanide
E.M.F.	1½-3 volts
Temperature	Room
Time	A function of the thickness of plating desired

Because of its position in the electromotive series, silver will deposit on steel or copper by immersion alone. To prevent this, the plater must turn on the current before setting the barrel in position. He thereby prevents the formation of a loose film which will otherwise form on the parts being plated and will prevent satisfactory adhesion of the electrodeposit.

To obtain good bright deposits of silver plating, the operator usually adds a small amount of carbon disulphide to the solution. Any excess carbon disulphide

is detrimental, however, to the proper functioning of the bath.

### Black Oxidizing

In black oxidizing, which is an immersion process, the barrels and tanks are considerably larger than in electroplating proper. They are mostly designed for 75-pound loads. Because no current is required, a large volume of toy train parts may be processed by this method.

The heavy perforated steel barrels used in black oxidizing are lowered into steel tanks and revolved in the solution at a constant rate. A chain type of motor drive actuates the barrel rotation. The motor is situated on top of the barrel itself.

If parts to be coated are rusty, they receive a hydrochloric acid dip, followed by a water rinse and a 2-minute dip in an alkali cleaner, then two water rinses, one in cold and one in hot water. When they are ready to receive their black oxidizing finish, the barrel is immersed in the oxidizing solution having a concentration of approximately 8 pounds per gallon. The temperature of the solution is gas-heated to 300 degrees Fahrenheit and the tanks are equipped with safety guards to prevent the operators from moving the gas cocks with their feet. The time cycle ranges from 20 to 30 minutes.

Copper and iron are the most frequent impurities in the black oxidizing solution. A too high salt concentration or a too high temperature dissolves iron from the tank, and it is then redeposited as a red smut on the work. Copper is most commonly removed by displacement reaction. Figure 4 shows the exhaust hoods which carry off the fumes.

After black oxidizing, the operator lifts the barrels by means of an overhead hoist and guides them to rinsing and cleaning tanks in which they receive two cold water rinses and one hot water rinse. The cleaning tanks are equipped with steam coils for heating purposes. A final hot soluble oil dip affords protection and lustre to the black oxidized parts, which then pass with the aid of a steel chute into a large centrifugal drier for drying and excess oil removal.

### Conclusion

The story of this plant's electroplating department is an interesting chapter in company history. It includes still further types of plating and many refinements worked out and developed on the basis of an experience dating back to the early years of the century. The use of the revolving barrel technique has come into particular prominence at this plant, of course, because of the great number of small, even tiny parts which have to be processed. When one contemplates the difficulty and expense that would be entailed in plating such pieces by any other method, one easily perceives the economy and desirability of barrel plating.



# Electrolytic Polishing of Magnesium

By George Black, *Hollis, N. Y.*

**D**URING the past few years such tremendous strides have been made in the anodic polishing of metals that any attempt to list the patents, technical and promotional material, and available data, would result in an enormous bibliography. There can be no doubt about the successful advances made in electrolytic polishing. The only sour note seems to be the absence of data concerning the treatment of magnesium and its alloys. In this forest of information there is barely a splinter relating to methods for anodic polishing of these alloys which continue to grow in popularity because of the miraculous developments of research engineers. It is the purpose of this paper to present in detail a few of the methods for anodic polishing of magnesium alloys which have been set forth in British patents.\* It is hoped that this introduction to the field will serve to stimulate the preparation of other papers so that a functional literature of electrolytic polishing as related to magnesium alloys will be created.

Although the mechanism of anodic polishing is still under research discussion and debate, it is generally agreed that the term should be applied to any method for smoothing or leveling metal surfaces by making them the anode in a suitable electrolyte. The resultant action may be described as the formation of a film of reaction products on the surface of the anode, which causes the blanketing or shielding of depressions and the subsequent concentration of anodic dissolution on the exposed portions or peaks. As these projecting areas dissolve away under the concentrated action, they become increasingly protected by the blanketing film, until the complete anode surface has been leveled to uniform smoothness. Further action is equally distributed over the entire surface, which will remain smooth and bright as metal is uniformly and gradually dissolved away.

The numerous advantages to be obtained from electrolytic polishing methods are sufficiently clear to justify the terrific research expenditures allotted.

Let us for a moment glance over the advantages as listed in the patents referred to:

1. Fully automatic
2. Extensive labor economy
3. Uniformity of results—minimizing of the personal factor
4. Recesses in intricate shapes may be polished easily
5. Fragile parts can be polished without danger of breakage
6. Patterns or letters can be imprinted by the use of stop-off materials
7. Unusual speed—1 to 2 minutes at high current densities
8. Variation in appearance through controlled means: matte, semi-lustre, or high polish
9. Precleaning operations eliminated, with the exception perhaps of degreasing
10. Applicable for continuous process in production of rolled strip

With this list of advantages applied to electrolytic polishing of magnesium as opposed to mechanical polishing methods, it should be obvious that research engineers have considerable incentive to get moving.

Anodic polishing processes employing aqueous electrolytes have been developed for most metals; however, when these same solutions or variations of them are applied to magnesium alloys, a roughening rather than a polishing action occurs. It is now generally agreed that aqueous electrolytes are unsuitable for use with magnesium alloys as they tend to directly corrode the metal and to produce insoluble magnesium corrosion products on the surface which interfere with polishing conditions. The use of non-aqueous solutions has been proposed and successfully demonstrated for the polishing of stainless steels, tin, lead and aluminum. It now remains for us to transfer the data gathered from the development and use of these water-free electrolytes into the field of magnesium polishing.

\* British Patents No. 550,175, 550,176 to Magnesium Metal Corp., Ltd.



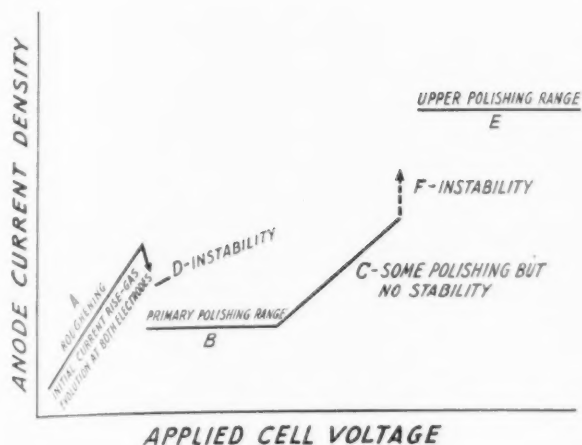


Figure 1.

It took a lot of experimentation, but it was finally concluded that highly satisfactory polishing of magnesium base alloys could be accomplished in a substantially non-aqueous electrolyte when the solution, temperature and current conditions were so selected that the current/voltage relationship, when expressed graphically, yielded a curve of the same general shape known to occur in the case of other metals. The patents referred to provide for the use of a non-aqueous solution, characterized by the formation of soluble metal ion complexes which promote the growth of a viscous layer in the vicinity of a magnesium anode, under the conditions of voltage and current density which polish the anode and which are defined by a range of substantially constant current density.

The polishing curve, as shown in Figure 1, shows the general relationship between applied cell voltage and anode current density which is observed in the successful polishing of magnesium and its alloys. Actually, there are six stages or phases which are distinct; they are referred to as stages a, b, c, d, e, & f, and are characterized as follows:

Stage a)—An initial rise of current accompanied by increasing gas evolution at both electrodes, ending in an unstable range in which the current density falls rapidly and the gas evolution at the anode is reduced greatly or stops altogether.

Stage b)—Approximate constant current density for a substantial increase of applied voltage. This is a primary polishing range.

Stage c)—Gas evolution begins again and there is a rise in current density with an increase in voltage. Some polishing occurs, but there is no stability in operating conditions. Ends with sudden current density increase.

Stage d)—This is the unstable range at the conclusion of stage "a" in which the current density falls rapidly and the gas evolution at the anode subsides.

Stage e)—Represents a period of substantially constant current density for a considerable increase in current. This is an upper polishing range discovered for the successful treatment of magnesium alloys.

Stage f)—This is the period of instability, associated with a sudden increase of current density for

a small increase of applied voltage, which occurs at the end of stage "c". (A reversal of the first discontinuity as expressed in stage "d".)

The authors of the patents sum up these stages by stating that polishing is effected under high anode current density conditions following a period of instability subsequent to comparatively low anode current density polishing conditions in the relationship between applied cell voltage and anode current density. They claim that anodic polishing in this manner, with the solutions they have tried, increases the luster of a magnesium alloy surface and effaces irregularities or scratches up to a maximum depth governed by the thickness of the viscous anode layer formed. This is generally conceded to be in the order of  $5 \times 10^{-3}$  cm. Major contours are not affected and the sharpness of important edges is preserved. Scratches left by 000 emery are polished away by the recommended treatments. In general, articles should be prepared by machining or grinding to a finish not exceeding the degree of roughness just indicated.

The variety of solutions tried are indicated by the general statement referring to possible electrolytes. Solutions of hydrochloric, perchloric, hydrobromic, hydrocyanic and formic acids, singly or together, with alkyl halides, acetic, citric, oxalic, boric and benzoic acids are suggested in the following solvents: Methyl and ethyl alcohol, cyclohexanol, pyridene, polyhydric alcohols and derivatives, of which ethylene glycol, glycerine, diethylene glycol monoethyl ether, ethylene glycol monoethyl ether, and ethylene glycol monomethyl ether may be particularly mentioned.

The five solutions listed as examples in the two patents being discussed are as follows:

1. Perchloric acid in acetic anhydride
2. Nitric acid in ethyl alcohol
3. Nitric acid in methyl alcohol
4. Perchloric acid in ethylene glycol monoethyl ether
5. Hydrochloric acid in ethylene glycol monoethyl ether.

In the first suggested solution, perchloric acid is dissolved in acetic anhydride in the proportion of 1 to 3. The voltage used is dependent upon the composition of the alloy, but in the test described, a magnesium alloy containing 6% aluminum and 1% zinc was successfully polished between 20 and 30 volts with a corresponding current density of 0.5 amps./sq. dm. The maximum temperature is listed as 30° centigrade. For an alloy containing 2% manganese the same voltage was satisfactory, but a current density of 10 amps./sq.dm. was used. Polishing is exceedingly rapid with this method. Solutions 2 and 3, consisting of nitric acid in ethyl and methyl alcohol respectively were also used with success. Careful handling of these solutions is required because of their liability to explode.

The perfecting of solutions 4 and 5 was instigated by the necessity for finding a polishing method sub-

(Continued on page 94)

# Rectifiers for Electroplating—Part III

## Conclusion

By Louis W. Reinken, Chief Engineer, W. Green Electric Company, Inc., New York City

### Dual Output Rectifier Units

IN THE preceding sections we have described, in general terms, the operation of a number of complete rectifier units, each with its own voltage controls and meters, in series-connected or parallel-connected groups. However, the same basic principles are used in "dual-output" rectifiers, to provide greater flexibility in a single rectifier unit.

The block diagram of a typical dual output unit is shown in Fig. 19. Up to the secondaries of the main stepdown transformer, the unit is identical with any standard rectifier unit. At this point, however, the circuit divides into two separate rectifier sections with separate positive and negative terminals. These terminals may be connected in parallel for maximum current capacity at lower voltages, or in series for higher voltages and correspondingly lower current capacities.

For example, the unit illustrated in Fig. 20 provides a choice of: 0-8 volts, 1500 amperes; or 0-16 volts, 750 amperes, simply by changing connections of the D.C. output terminals appearing on the right hand side of the cabinet. A dual range ammeter automatically provides full scale reading (1500 amperes or 750 amperes) for either the parallel connection or the series connection.

### Multi-Output Units

The basic circuit of the dual output unit may be extended to more than two rectifier sections. By using as many as six sections, a wide range of voltages and current capacities is made available for laboratory work from a single rectifier power supply unit.

In Fig. 21, which illustrates a three-phase unit of this type, the smaller terminals and links on the right hand side permit the desired range to be selected, while the load remains connected to either the left hand pair or right hand pair of wingnut terminals.

The unit illustrated incorporates six similar rectifier sections, each with maximum ratings of 8 volts and approximately 18 amperes. The four possible combinations which use all six sections are:

Parallel	Series	Voltage Range	Max. Current
6	1	0-8 volts	100 amps.
3	2	0-16 volts	50 amps.
2	3	0-24 volts	35 amps.
1	6	0-48 volts	18 amps.

Obviously, these ranges permit research and test work on all kinds of processes, including low-voltage high-current plating, barrel plating, high-voltage clean-

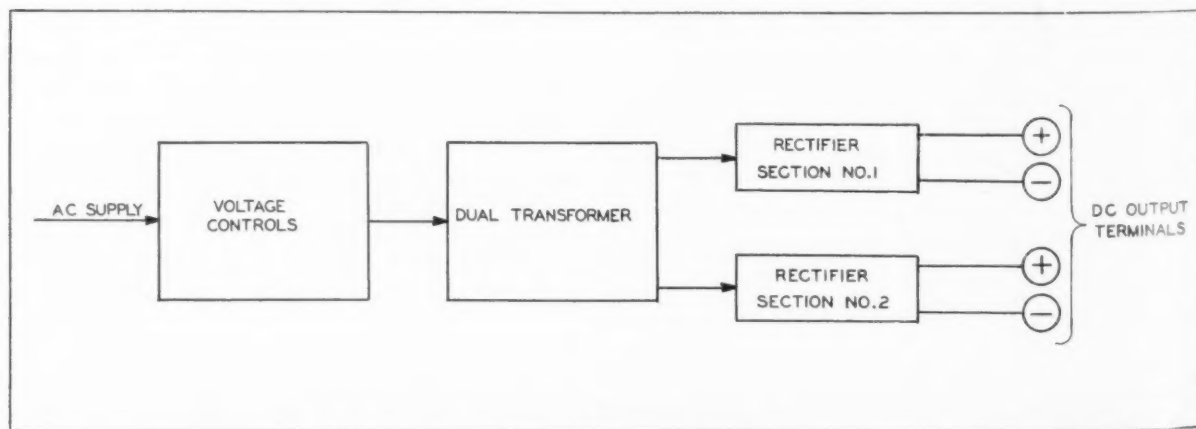


Fig. 19. Dual Output Rectifier

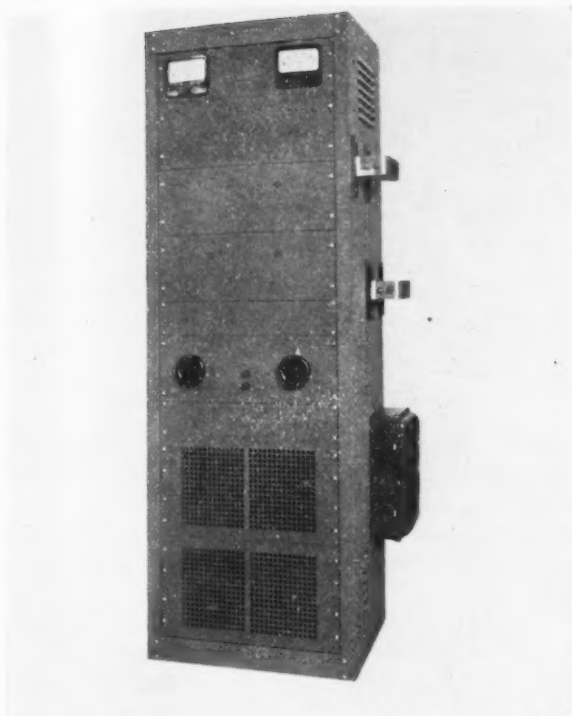


Fig. 20

ing and either moderate-voltage or high-voltage anodizing.

This laboratory unit has been described in detail because it beautifully illustrates the electrical flexibility attainable only with the rectifier type of power supply. As will be seen in following sections, this principle of flexibility may be extended also to large scale operations in the plant where a single group of rectifier units may be adapted to supply power for any kind of process from chromium plating at 5 volts to anodizing at 48 volts.

#### Series-Connected Rectifiers—Anodizing

The basic theory of parallel-connected and series-connected groups of rectifiers has already been outlined and we have also discussed in some detail the practical operation of a parallel group. In this detailed discussion it was explained how the internal voltages and internal resistances of the individual rectifiers determine the division of total current between the units.

In a series-connected group, the question of division of current does not arise, since the current passes through all of the units and is the same in each unit. However, the internal resistances of the units produce an interesting and very useful phenomenon in chromic acid anodizing. To explain this, we have sketched Fig. 22, which shows six 8 volt rectifier units connected in series with a chromic acid anodizing tank.

For simplicity, it is assumed that each rectifier may be either "ON" or "OFF" and when "ON" it develops an internal voltage of 8 volts; when "OFF" the internal voltage is, of course, zero. A group like this could easily be controlled from a small remote control unit equipped with ON/OFF push buttons for each unit

and a voltmeter and ammeter to indicate the total tank voltage and the anodizing current.

The anodizing process is begun with a comparatively low tank voltage because, until the anodic film is formed, the tank resistance is very low and high voltages would cause high currents to flow, which might burn the work or damage the power supply equipment. As the anodic film forms and increases in thickness the resistance rises, and it is necessary to increase the tank voltage to maintain adequate current flow.

There are two generally accepted methods of controlling the anodizing process. In one, tank voltage is periodically increased at definite time intervals. In the second, maximum safe current is first determined on the basis of work area and current density, and the tank voltage is progressively increased (irrespective of time) to keep the tank current at, or near, the specified maximum. In either case, the tank voltage is increased to compensate for the increasing resistance of the anodic film, and the process is finally completed at the maximum desired voltage (usually 40-48 volts), for a period of about 30 minutes.

The ticklish part of the anodizing process is in the early stages when the anodic film is beginning to form and the resistance of the work and the tank solution is low. During this stage, and particularly when voltage is applied at the start, there is the danger of abnormally high currents due to the low resistance. This is where the rectifier group shown in Fig. 22 has a peculiar advantage.

At all times, regardless of how many rectifiers are energized, the total resistance of the rectifier group is about six times the internal resistance of one rectifier unit. Therefore when, at the start of the process-

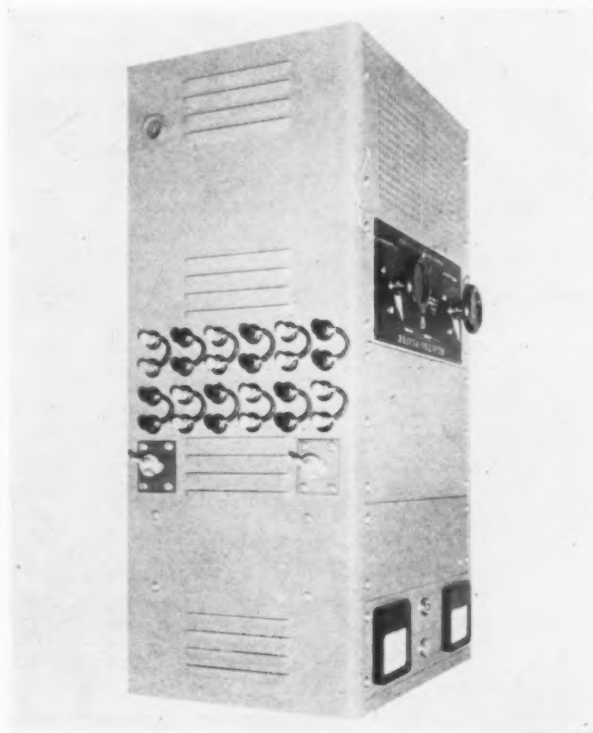


Fig. 21



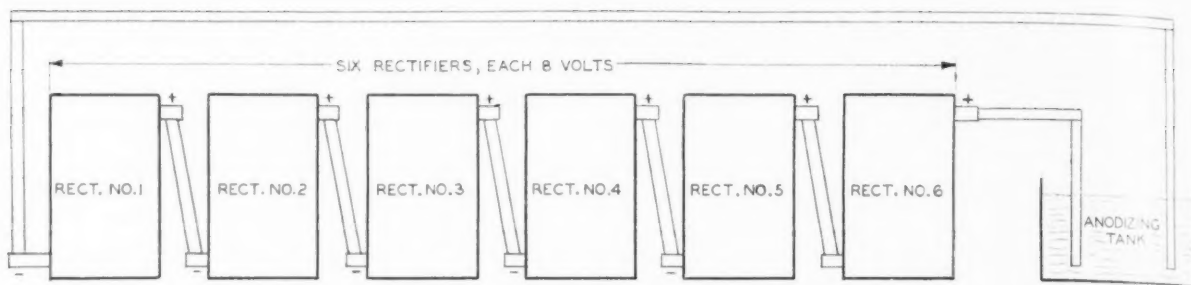


Fig. 22. Chromic Acid Anodizing with Rectifiers

ing, only one rectifier unit is energized, the current flow through the anodizing tank is determined by the ratio of the internal voltage of *one* unit to the sum of the tank resistance and the internal resistances of all six rectifier units in series. The voltage across the anodizing tank is, initially, considerably less than 8 volts—or putting it another way, the initial surge current is limited by the series resistance of the six units.

As the anodic film forms, the tank voltage automatically rises to compensate, and the tank current falls off comparatively slowly. At a predetermined interval, based upon (1) time or (2) the drop in the ammeter reading, Unit No. 2 is energized and adds its internal voltage to that of No. 1. This process is repeated until all the units are energized and anodizing is completed at the desired maximum voltage.

It should be noted that, for the first few minutes of the process, the ratio of rectifier resistance to tank resistance is high which is desirable for limitation of starting surge current, and in the final stage the ratio is low and is desirable for good efficiency.

#### Standard Rectifiers in Group Operation

In the preceding discussion of a series-connected group of rectifiers for chromic acid anodizing, the example utilized basic rectifier units turned "ON" and "OFF" from a remote control unit. There is no reason why standard units, each equipped with individual controls and meters, should not be used in the same way. As a matter of fact, this would probably permit a slight increase in the speed of the process since, by using the voltage controls on each successive unit, the operator could keep boosting the voltage in small steps to maintain the current always close to the predetermined maximum, thus reaching maximum voltage a few minutes sooner than if he were limited to only six steps of voltage control.

Obviously, a group of such individually complete power packages may be reconnected in parallel for low voltage-high current tank plating, or in series-parallel (for instance, 12 or 16 volts maximum) for

barrel plating, or those processes in full-automatic machines requiring more than 6 or 8 volts.

Finally, since each unit is complete in itself, it may be individually used to supply power to a single small tank, or to a single section on a full-automatic machine.

#### Flexibility vs. Economics

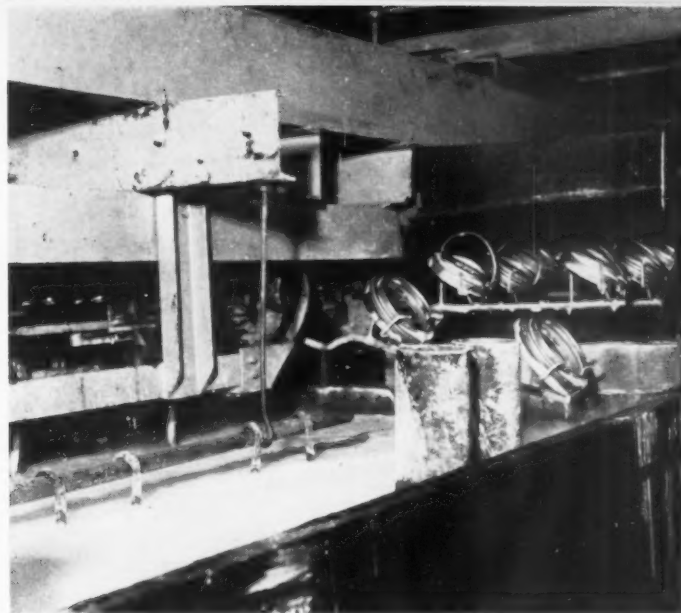
A great deal of space could be used in describing actual installations of parallel and series groups but from the general principles already discussed the plating superintendent should be able to see whether or not the flexibility inherent in rectifier grouping is of advantage in his particular plant.

The writer feels that a word of caution about multiple-unit banks is in order. When rectifier equipment was first introduced, the flexibility provided by series and parallel connections was an entirely new concept in electroplating power supply and had to be explained in detail. Now there is a tendency to go overboard for the idea and to split up the required current capacity between a large number of small units even when there is no economic justification for such a step.

It should be remembered that single rectifier units are now available in comparatively high current capacities, and ten 500 ampere units necessarily cost more than one 5000 ampere unit. Also, the cost of installation, although lower for rectifiers than for motor generators, will generally be higher for a number of small units than for one large unit.

Bank operation, i. e., the supply of a single load from a group of rectifiers in parallel or series, should not be specified merely because it is possible. The advantages and disadvantages should be thoroughly explored, preferably with the aid of a rectifier manufacturer's representative who has already assisted in planning other installations. The two basic justifications for specifying a group of smaller units in preference to one large unit are:

1. The required capacity (volts x amperes) is too large for a single unit.
2. Flexibility in voltage and current capacity is desired for other processes. Sometimes a single unit with dual output will meet this requirement.



Parts being removed by automatic equipment from electrocleaner.

# Application of Metallic Coatings

## Conclusion

By Rick Mansell, Los Angeles, Calif.

**C**LEANERS with a high degree of emulsifying ability may need high temperatures to maintain them in solution and therefore require the rinsing water with a minimum temperature of 180 degrees F (alkaline electrolytic cleaners are not so alkaline as the soak tank and do not contain as much of the emulsifying agent; articles from them may be satisfactorily rinsed in cold water if desired). At one time there was trouble in using hard water in the cleaning tanks; this was softened by soda ash and the sludge permitted to settle to the bottom of the tank and removed at periodic intervals; but quite often the sludge was deposited on the work to be plated. At the present time cleaning compounds are designed to soften the water without the formation of precipitates. Often oxide solvents such as cyanides are added to alkaline cleaners.

In electrolytic cleaning, alkali salts such as sodium phosphate and sodium carbonate are added to control the alkalinity of the solution and to emulsify the foreign matter present. The tanks themselves are used as anodes and the object to be cleaned is suspended from the cathode bar. A sufficiently high voltage is applied so that a current density of at least 10 amperes per square foot is obtained at the cathode. This causes a vigorous evolution of gaseous hydrogen, which by a mechanical action tends to lift off grease films; an additional cleaning action takes place due to the formation of free alkali at the cathode. Again the gas evolution causes agitation of the solution and hence brings fresh portions of the tank solution to the cathode surface. It is noted that when zinc, tin or lead, or their alloys are cleaned electrolytically there is a tendency

for them to dissolve in the alkaline solution and be redeposited in thin films; these films may prevent adherence of electroplatings. Under these conditions the redeposited metal is removed by converting it into the function of an anode for a short time. The process of electrolytic cleaning has been used as a means of removing rolling oils from strip which is used in the manufacture of tin plate. Coils containing 5,000 feet of strip, three feet wide and 0.010 inch in thickness are degreased in this way at the rate of 900 feet per minute; making use of a hot solution of the ortho- and meta-silicates of sodium and a current density of 10 amperes per square foot.

To remove oxide, scale, or corrosion products it is necessary to use abrasion or pickling methods. Mill-scale is removed from iron and steel by pickling in a bath of 4 to 5% sulphuric acid at 150 to 170 degrees F. Heavily scaled parts are pickled in a 10% solution of hydrochloric (muriatic) or sulphuric acid at a temperature of 140 degrees F. After the pickling process the parts are dipped in a 2-ounce per gallon solution of soda ash or any other neutralizing agent. When springs or other parts that are fabricated from steel wire are pickled, they should be baked for one hour at 300 degrees F at the end of the process. Low carbon steels that have a heavy scale are treated with an acid pickle in cold 35% sulphuric acid or in a 20% solution at 110 degrees F, or in a 10% solution at 140 degrees F. High carbon steels can be treated with a cold solution of 30% nitric or hydrochloric (muriatic) acid. Corrosion resistant steels can be cleaned at room temperature in a solution of 25% nitric acid and 2% hydro-

fluoric acid or by a solution of 10% nitric and 1% hydrofluoric acid at 160 degrees F. They are then rinsed with water and all loose scale removed by pressure spraying with water. Any clinging scale is removed with a stiff fibre brush. The corrosion resistant steel is then passivated by immersion in a water solution of 50% nitric acid at room temperature for one to two hours; it is then thoroughly rinsed in water. To remove soldering acids from steel the contaminated area is treated with an alkaline solution composed of equal parts of ammonia, alcohol and water. Welding and bronzing fluxes are removed from steel by grinding off the flux with an emery wheel. For removing welding fluxes from aluminum parts a ten percent solution of sulphuric acid is used. Brass and copper alloys are pickled in a mixed cold solution of 50% sulphuric acid, 15% nitric acid, and 1/2% hydrochloric (muriatic) acid; or by a mixture of sulphuric acid and hydrochloric (muriatic) acid containing a small amount of nitric acid.

From this short survey on the composition of the pickling baths it can readily be seen that there is a fair amount of flexibility, and that the exact composition will have to be arranged to suit individual conditions. Whichever mixture is used, it is necessary that all acid pickling baths contain inhibitors, this is particularly important in the case of steel. Inhibitors are employed to decrease the acid attack on the metal itself (this is usually accompanied by the evolution of hydrogen), without appreciably altering the rate of scale removal. Inhibiting properties are possessed by about 150 known compounds; but is particularly possessed by aliphatic and aromatic amines and their derivatives; by pyridine and quinoline and their derivatives; and also by other compounds which must have free rinsing and non-foaming properties and which are non-toxic. One of the standard inhibitors is a compound of thio-urea. The inhibitors may be truly soluble in the pickling bath or they may be colloiddally dispersed and still function efficiently. In all cases of acid pickling the temperature is very important; for example a rise of 17 degrees F in temperature can increase the action by about five times. It is therefore necessary to control the temperature by installing cooling and heating coils with a thermostatic control. A recent type of pickler is a molten salt bath which operates electrolytically at 500 degrees F; it is particularly effective for deoxidizing and descaling cast iron, as it removes silica. The main purpose of pickling is to remove scale and oxides; in this respect it is very effective and inexpensive as compared to tumbling or sand blasting. Occasionally after pickling, the surface is given a final roughening by etching or abrading to improve the adhesion of the coating.

Electrolytic pickling is particularly useful for removing the oxides on machined parts which have been heat treated. The object to be pickled is hung on a cathode rod and suspended in a lead or rubber lined tank containing sulphuric acid. The anode is composed of a metal which forms protective films on the object; for example, lead, tin and zinc are commonly used. The temperature that can be used varies, but the method is more rapid than chemical pickling and

permits the use of lower temperatures. A sufficient high current density is applied so that large amounts of hydrogen are evolved at the cathode. A common electrolyte used in dilute sulphuric or hydrochloric (muriatic) acids containing some sodium chloride and the temperature is about 150 degrees F. With a lead anode and with chlorides in the electrolyte an attack on the lead is made which results in adherent metal films of lead being deposited on the object being pickled. This action continues until all the scale has been removed and the surface of the object has been coated with the lead film. The object is then removed from the acid bath and made the anode of an electrolytic cleaner containing soda ash, caustic soda and a small amount of sodium phosphate at 200 degrees F. In this particular bath the lead coating is removed from the object and at the end of this treatment it is withdrawn, washed and dried. The process is stated to be free from all the usual difficulties of pickling, including hydrogen embrittlement. The acid bath does not have to be as carefully controlled as that in straight chemical pickling because after the first layer of lead has been deposited, further action merely produces a spongy porous deposition which is not adherent or objectionable.

Sandblasting is very popular for oxide removal particularly in those cases where a surface of a roughened nature is desired to improve the adherence of certain types of coatings. As abrasives, sand has been replaced to a considerable extent by steel grit and shot. The abrasive is applied by means of air at a pressure of anywhere from 25 to 100 pounds per square foot. The blast is directed over the metal surface until the oxide scale is removed. In the case of automatic conveyor type blasting machines, the nozzles are so arranged as to provide a more or less uniform blasting of the surfaces of the parts. The process of blasting tends to induce a certain amount of surface hardening. Grit blasting is particularly suitable for rough sand castings; although castings are often descaled and deburred by means of tumbling in a revolving drum.

Grinding operations utilize a solid wheel composed of hard coarse abrasive, which may be silicon carbide or fused alumina, and are sometimes used to remove hard mill scale.

Polishing and buffing operations are used to produce smooth surfaces whenever it is required to produce electroplated coatings of a very smooth nature. The polishing wheels are made from felt or leather and are coated on the outside surfaces with abrasives such as emery, corundum, or fused alumina held in their position by means of glue. There is another type of polishing wheel composed of solid discs of wood or metal over which is slipped a sleeve faced with abrasive. Buffing wheels are made of sewed cloth or canvas, and the abrasive is not in this case a part of the wheel, but is applied to the wheel at intervals, from a bar or a cake containing a binder of rosin and tallow or petrolatum. The more popular abrasives used for buffing are tripoli, rouge and pumice. Idler wheels with belt type abrasives are rapidly coming into vogue.

In all of these mechanical operations there is difficulty in the removal of polishing and buffing com-



pounds. This is obviated by the process of electropolishing which is now a commercial operation. It gives an ideal bond for plated metals, due in part to the absence of mechanically damaged metal, embedded dirt and oxides, and also to the absence of strained metal sections. Electropolishing levels the recessed surfaces as well as the relief areas and gives a very attractive tone to the work. There are many applications where mechanical polishing cannot be replaced by electropolishing since the latter does not have the cutting and burnishing action of wheels and tumbling barrels. In electropolishing there are two practical patented methods. The first employs a 63% solution of sulphuric acid and is operated at 250 to 560 amperes per square foot and a temperature of 85 to 140 degrees F. The second employs a mixture of 15% sulphuric acid and 63% phosphoric acid; this mixture requires less critical control and will permit broader operating ranges. Since it is an electrolytic process the surface has to be really clean. Thus, in addition to the electropolishing tank and two warm rinses, necessary auxiliary equipment such as cleaner, scale remover, and racks are needed. The racks used are built to carry higher currents than are normally used in plating. Chemical lead lined equipment is used.

Chromium, bright nickel and bright copper can be electrodeposited immediately after the rinse following the electropolishing operation. It is found that bright cold rolled steel that has been electropolished for 15 seconds can be bright nickel plated directly after rinsing. The process of electropolishing produces a passivation of all metals and so helps the tarnish resistance. The most remarkable benefits are found with stainless steels which are considerably improved over the condition given to them by the usual nitric acid passivation.

### **Electrodeposition**

We have thus far considered the question of corrosion; of cleaning and pickling operations; polishing methods; the historical developments in the process of coating base metals. Short surveys of the actual processes in use today will now be given. These include the hot dip processes; electroplating; metal spraying; cementation; metal cladding; cathode sputtering; and the process involving condensation of metal vapors.

In the hot dip processes the article that is to be coated is dipped in a bath of a molten metal or alloy and then removed from the bath after a sufficient time has elapsed. Adhering to its surface is the coating metal. This coating metal is selected on the grounds of possessing a relatively low melting point. If high temperatures are required to melt it, there is a possibility of the mechanical properties of the base metal being altered. In addition contamination of the coating metal by a dissolving action of the base metal is possible. These hot dip processes are used widely for applying coatings of the low melting metals and alloys, such as zinc, tin, lead,terne plate (lead-tin alloy), and solders.

In electroplating the base metal is made the cathode in a bath of suitable composition. The character of the metal deposit depends on the current density (the

number of amperes per unit of cathode area), the temperature and the bath composition. If all the current is being used to deposit metal at the cathode (i.e., if there is 100% current efficiency) the amount of metal deposited by a given current in a given time may be calculated by Faraday's Law. In most electroplating processes, the coating material is made the anode and the conditions are so adjusted that the coating metal goes into solution at the anode at the same rate as it is being deposited on the base metal at the cathode; in this way a constant bath composition is maintained. In the case of chromium plating a lead or lead-antimony anode is used, i.e., an insoluble anode; composition of the bath is maintained by the addition of chromic acid at regular intervals. With the possible exception of the hot dipping of zinc and tin coatings, the method of electroplating or electrodeposition is the most important method for applying metallic coatings. Zinc, copper, nickel, tin, chromium, cadmium, lead, gold, silver, brass, bronze, coronite (nickel-zinc alloy) can all be applied electrochemically.

Metal spraying was developed by Schoop in 1910. Molten metal is atomized and is then deposited on the surface to be coated by a light weight pistol which can be held in the hand and which will permit the stream of metal to be directed in a controlled manner. In most cases the metal is fed through a central barrel in the form of wire. A gaseous mixture of hydrogen, city gas, or acetylene mixed with oxygen or air is supplied through a tube which surrounds the wire barrel. The gas is burned at the orifice and melts the section of the wire which protrudes into it. An outer tube surrounds the gas inlet and through it compressed air or any other gas is forced under pressure. This atomizes the molten metal and projects it against the surface to be coated. There is another type of pistol in which the metal is melted in an electric arc formed between two wires of the metal. In other types the metal may be supplied in the form of a powder or in the form of previously molten liquid metal. The metal film may be applied as desired to any given spot or it may be applied to the finished structure in its fixed position. The thickness can be controlled between fairly narrow limits. It possesses the advantage that irregular objects can be given a coat more readily than most other methods. Sprayed coatings tend to be rougher and harder than other coatings; but they are more porous and less adherent. For good adherence it may be necessary to roughen the surface of the base metal. To obtain a comparable protection to that of coatings applied by other methods such as hot dipping or electrodeposition, it is necessary to apply a thicker coating. The metal spraying method is used for applying coatings of aluminum, brass, cadmium, copper, lead, monel metal, nickel, tin, zinc.

In the cementation process the base metal, usually iron or steel, is protected from corrosion by alloying its surface with another metal. The work to be treated is packed in the powdered coating metal, or in a mixture of the powdered metal and a filler. The whole is heated at a temperature somewhat below the melting point of the more fusible metal. Diffusion of the coating metal into the base metal takes place and an alloy

layer is formed. The heat-treatment is carried out in an atmosphere of hydrogen or in any inert or reducing atmosphere. This method has been used for producing alloy layers on the surfaces of iron or steel articles. When zinc is used, the process is called Sherardizing; when chromium is used it is called Chromizing; for aluminum, Calorizing; and for silica it is called Silicizing or Ithrigizing. The case hardening of steel by cementation with carbonaceous materials in the pack carburizing process may be cited as an example of this classification.

The process of metal cladding has become very popular in recent years to give corrosion and wear resistance. In one method, a duplex ingot containing the coating material on the outside is first cast, and the ingots rolled into sheet, bar, or plate, or drawn into wire. In this way, copper covered steel articles are made from ingots of copper cast about a steel core in the copperweld process. Aluminum alloys are coated with aluminum (Alclad) by casting an ingot of the alloy in a steel mold lined with sheet aluminum. Tin coated foil is made by rolling a composite ingot obtained by casting tin around a bar of lead. Again, steel sheet clad with stainless steel may be produced by rolling composite ingots. Another method of cladding involves rolling stacked clean sheets or plates of the two materials together; the weld between the two materials being obtained in the rolling operation. Some

coatings are obtained by the actual fusion of the cladding material over the surface to be coated.

The process of cathode sputtering is suitable only for certain limited application. A potential of 500 to 2,000 volts is applied between two electrodes in a partial vacuum (0.01 to 0.1 mms. mercury); this induces a glow discharge and the cathode metal undergoes disintegration and is deposited in thin films on nearby objects in the system. By a properly designed chamber and with the appropriate location of the object to be coated it is quite possible to produce uniform films of the cathode metal. This method is especially useful for producing thin metallic films on fabrics, phonographic recording waxes, and other materials that are not conductors of electricity. In this process the cathode metal is vaporized by local heating due to the bombardment of positive ions.

The process of condensation of metal vapors is arranged by having a crucible containing the metal to be evaporated placed in contact with a platinum or tungsten wire heating element in a system which is evacuated to about 0.0003 mms. of mercury. The metal vapor will condense to form a uniform film on a cool solid surface placed in the correct position in the system. Another related process is the production of metallic films by the decomposition of gaseous compounds of the metal; for example, the deposition of nickel by the decomposition of nickel carbonyl.

## ELECTROLYTIC POLISHING OF MAGNESIUM

*(Continued from page 37)*

stantially free from the liability to explode. Perchloric acid, specific gravity 1.6, was dissolved in ethylene glycol monoethyl ether in concentrations of from 5 to 20% by volume. With the anode and cathode spaced about 13 mm. apart the working voltage ranged from 1 to 5, with an anode current density of 1 amp./sq.dm. and a temperature between 20 and 30° C. Rapid polishing was effected. Solution number 5 consisted of 10% by volume of hydrochloric acid of sp.gr. 1.2 in ethylene glycol monoethyl ether. With a spacing of 5 cms. between anode and cathode, rapid polishing was effected under 5 volts, at a temperature of 40° C. and an anodic current density of 1 amp./sq.dm.

These methods result in a polished surface, which when washed in water, will remain bright and untarnished for several weeks. Although the solutions used are described as non-aqueous, they are not completely devoid of water. In fact, the addition of various amounts of water may increase the conductivity and the brilliance of the polished surface. Permissible content of water, however, must be determined through experimentation. The nature of the cathode is not a controlling factor and should therefore be chosen from the viewpoint of economy and availability. The

cathode may be isolated by partitions to prevent copious hydrogen evolution from interfering with conditions at the anode, and the spray can be largely prevented by covering the surface with a layer of light oil. Agitation of the electrolyte is desirable as it discourages the adherence of bubbles to the anode surface, and prevents streaming of the anode viscous layer.

Limits of the polishing range can not be defined but are marked by increasing deterioration of the surface finish and stability of cell conditions. In particular, evolution of gas and staining at the anode surface, or fluctuations of cell current are signs that the polishing limits have been exceeded.

Undoubtedly this is just the beginning. The hundreds of problems which will arise under actual production conditions are yet to be ironed out. The numerous advantages of electrolytic polishing have been repeatedly demonstrated for the other metals, while magnesium gradually became more and more conspicuous by its absence from the various available lists of recommended anodic polishing methods and solutions. The skeleton is now out of the closet; and it must be agreed, after looking it over closely through the eyes of these two British patents, that there is plenty of life in the old boy yet. Electrolytic polishing of magnesium and magnesium base alloys may soon take its rightful place among the successful developments of research engineers.

# Electroplating Non-Conductors

By Thomas A. Dickinson, Los Angeles, California

IN MAKING experimental articles from plastics and other non-metallic materials, it is often desirable to apply metal coatings in order to determine what the articles will look like if and when they are fabricated from metals for production purposes. These metal coatings can be applied with such tenacity that they will resist even the wear to which moving parts are subjected—for short periods of time, at any rate—by means of a simple process developed recently.

The necessary plating set-up is shown in the accompanying diagram. It is suitable for the plating of any article which can be immersed in not more than a gallon of plating solution.

The non-metallic article should be made resistant to the plating solution by coating thoroughly with lacquer, then it can be made electrically conductive by dipping in liquid wax and rolling in powdered graphite or some other highly-conductive metal powder. Consistency of the conductive coating should be checked with an ohmmeter before the article is hooked up to serve as a cathode in the plating tank, and if the coat-

ing is inadequate it should be removed so that the waxing and metallizing procedure can be repeated with more care.

Low voltages are necessary to prevent damage to the thin conductive coating. The plating tank may be made of glass or enameled iron, and for small work, should have a capacity of approximately one gallon. Ordinary copper connecting wires will satisfactorily transmit the required current, and the work should be agitated while plating.

Electroplating solutions that have been successfully utilized include:

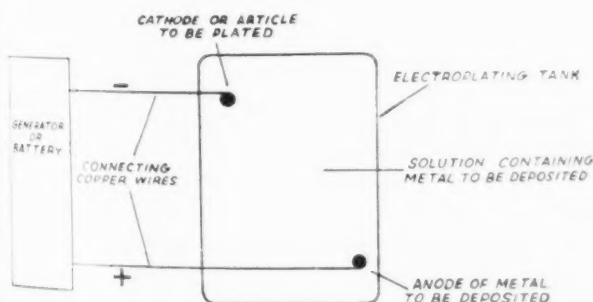
(1) For copper plating—six ounces of commercial sulphuric acid and 40 ounces of copper sulphate to a gallon of water. This solution may be used at room temperature. If it becomes weak, sulphuric acid should be added.

(2) For black-nickel plating—eight ounces of nickel ammonium sulphate, one ounce of zinc sulphate, and two ounces of sodium sulphocyanate to a gallon of water. This solution may be used at room temperature, and should be discarded when it becomes too weak for consistent plating.

(3) For chromium plating—33 ounces of chromic acid and 1/5 ounce of sulphuric acid to a gallon of water. This solution may be used at room temperature, and can be strengthened from time to time with additions of sulphuric acid.

(4) For gold plating—a half ounce of metallic gold fulminate or cyanide and two ounces of potassium cyanide to a gallon of water. This solution should be heated to about 150° F. while plating takes place.

As a general rule, metal coatings on non-metallic articles should not be more than .001-inch thick. This thickness can be determined by measuring the article before and at regular intervals during electroplating.



Set-up for electroplating non-metallic articles. The diagram is schematic, and minor details regarding arrangement may be varied in conformity with local conditions.



# This Is Washington

By George W. Grupp, *Metal Finishing's Washington Editor*



## Business Tax Policy of USCC

At the 35th Annual Meeting of the Chamber of Commerce of the United States, held in Washington, D. C. from April 28th to May 1st, the members voted the adoption of this policy on business taxes: "The heavy weight and burden of current business taxes deters capacity production and new investments in facilities. These are the main means of realizing full peacetime employment and, with a balanced budget, are the real antidotes to inordinate prices and inflation.

"There should be full recognition of the principle that the combined burden of taxes upon business undertakings and investors therein should not prohibit a fair return, after taxes, commensurate with the risks involved.

"Substantial reduction of the burden of taxation will be more conducive to economic progress than the development of an elaborate system of partial and complete exemptions or other unusual incentive devices to ameliorate excessive rates.

"The impact of high taxes has demonstrated the unfairness and unsoundness of the double taxation now applicable to corporate earnings. This equity should be eliminated without resort to an undistributed profits tax.

"The present provisions for carryback and carry-forward of net operating losses should be continued, pending early permission to carry forward such losses for seven years in lieu of a right to carry them back. The principle of averaging incomes over a reasonable period of years should be given suitable recognition in the cases of both corporations and individuals.

"The corporate rate, with abandonment of the sur-tax device, should be progressively reduced with a view to early establishment of a rate of less than twenty-five per cent. There should be immediate repeal of the tax upon intercorporate dividends and of the penalty rate upon consolidated returns with optional use of such returns permitted. There should be establishment of adequate and realistic provisions for depreciation, deferred maintenance and reserves; no technicalities should be interposed to prevent taxpayers from recovering free of tax the full cost of depreciable property.

"There should be eventual elimination of the tax upon capital gains. Meanwhile, the rates applicable to capital gains should be reduced persistently until a flat rate not in excess of twelve and one-half per cent is established. This will encourage transactions and create new revenues. Offset of losses and gains should be continued, but excess losses should be allowed against other income with the resulting tax reduction reasonably limited."

## 99.999 Per Cent Zinc

Recently the Office of Technical Services of the Commerce Department issued report "PB-46427: New Way for the Production of 99.999 Per Cent Zinc" which is being sold at \$1.50 per photostatic copy. This report describes how electrolytic zinc 99.999 per cent pure can be recovered from pyrite cinders on a commercial scale by a German amalgam process which simultaneously produces free chlorine. Unlike the usual electrolytic zinc process which uses sulfate solutions, the German process uses a chloride solution, a metal cell and a amalgam cell. In the amalgam cell the zinc chloride solution is electrolyzed between a graphite anode and a mercury cathode forming 2.5 per cent zinc amalgam and chlorine. The zinc amalgam is sent to the metal cell where it becomes the anode in an electrolyte of sulfuric acid and zinc. In the metal cell zinc is deposited on an aluminum cathode. From this cathode the metal is stripped twice a day. When the electrolyte in the metal cell builds up in zinc and decreases in sulfuric acid concentration, it is passed through a Tainton process zinc cell with lead anodes. Here additional zinc is recovered and the sulfuric acid is regenerated.

The zinc obtained by this process the report claims to be 99.999 per cent pure, the impurities consisting of 3 p.p.m. of aluminum, 5 p.p.m. of copper and 2 p.p.m. of mercury.

## An Improved Method of Recovering Precious Metals

The Office of Technical Services of the Department of Commerce has just released a 27 page report, price \$2.00 per photostatic copy, which is called "PB-44661:

Precious Metal Refining and Fabrication." This report, which is illustrated with photographs and drawings, describes how the Germans simplified and improved the recovery of precious metals from scrap metal and nickel refinery residues by applying ingenious variations to well-known basic processes. The entire German process for recovery of the platinum group of metals (platinum, iridium, palladium, ruthenium, osmium and rhodium), is described in this report. According to this report the Germans do not consider the usual soda and lye precipitation processes efficient in the separation of iridium and ruthenium. Better results were obtained with the hypochlorite method developed by Professors E. Mylius and A. Maz-zuchelli. The hypochlorite method is said to be especially good in the winning of platinum and admixed related metals when base metals are also present.

Electroplating baths of palladium, rhodium and platinum, and the production of mirror coatings by high vacuum evaporation of rhodium or aluminum, are also described in this report.

#### **Electroplating Influenced by Size and Shape of Anodes**

According to report "PB-47010: Anodes" (\$3.00 per photostatic copy), just issued by the Office of Technical Services of the Department of Commerce, the quality of electroplating is greatly influenced by the size and shape of anodes and their method of manufacturing. This 35-page report discusses the composition and uses of anodes and gives corrective measures for trouble caused by improper use. The report states that anodes are able to fulfill their two main tasks, to conduct current into the electrolyte and to maintain the metal content of the electrolyte as uniformly as possible, only if their chemical and physical properties are perfectly adapted to all requirements of the plating system. It points out that the important factors in determining the usefulness of anodes are size, shape, purity, solubility, method of fabrication (casting, rolling, hammering, extrusion, etc.), and susceptibility to polarization or formation of slimes and crusts. This report describes the correct uses of brass, cadmium, chromium, copper, gold, lead, nickel, tin and zinc anodes. A technical bibliography follows the discussion on each kind of metal anode.

#### **Trend Toward Monopoly as Seen by Freer**

Robert E. Freer, a member of the Federal Trade Commission, recently made the statement that "we have declared public policy regarding monopoly that is rooted in the principles of the common law and which has been embodied in and implemented by a series of antitrust statutes including the Sherman and Clayton Acts. But in the dynamic development of industry based on modern technology, the facts of concentration constantly tend to outrun the law." He then pointed out that since 1940 about 1,800 independent mining and manufacturing companies, with combined assets totalling \$4,100,000,000 were "swallowed up through merger and acquisition." He fol-

lowed that statement with this observation: "The 200 largest non-financial corporations own about 55 per cent of all the assets of all the non-financial corporations in the country. One-tenth of one per cent of all the corporations own 52 per cent of the total corporate assets. Less than 4 per cent of all the manufacturing corporations earn 84 per cent of all the net profits of all manufacturing corporations."

#### **Cole Wants Treasury to Establish Sinking Fund**

Representative Albert M. Cole of Kansas introduced H.R. 3192 which provides for the establishment of a sinking fund for the payment of Government obligations. The bill directs that "the Secretary of the Treasury shall, in each fiscal year, place \$10,000,000,000 of the money from taxes collected under chapter 3 of the Internal Revenue Code in such sinking fund." Under this measure the Secretary of the Treasury is directed "to use said sinking fund, first, to pay the interest on the obligations of the Government, and second, to retire and cancel such long-term bonds and notes as may mature or become callable within any given fiscal year"; and "the sinking fund shall not be used to pay interest on or to retire obligations owned by Government agencies or corporations."

#### **Depreciation Tax Deductions Urged**

The Machinery and Allied Products Institute of Washington, D. C. has issued a report which proposes that corporation tax depreciation deductions should be placed on a "purchasing power" basis. This plan would enlarge deductions because it takes notice of the 50 per cent rise in capital goods prices since 1939. In other words it is advocating depreciation tax deductions on a replacement basis.

#### **New Tax Plan for 1948 Announced by Knutson**

Representative Harold Knutson of Minnesota, chairman of the House Ways and Means Committee recently announced a new tax program for 1948. This program calls for the elimination of double taxation of dividends, further reductions in personal income taxes, and the rewriting of the Federal Revenue Code to eliminate "all possible wrinkles and bugs."

#### **Tinplate Allocations for Third Quarter of 1947**

The Office of International Trade of the Department of Commerce recently revealed the allocation of tinplate, according to countries, for the third quarter of 1947. These allocations total 120,000 short tons, a slight increase over those granted for the second quarter of 1947. The Latin American countries were allocated a total of 41,943 short tons. To non-Latin American countries there was allocated a total of 78,000 short tons.

#### **Nickel Oxide Plant Will Be Sold by WAA**

The Reconstruction Finance Corporation has de-

clared as surplus and for disposition by the War Assets Administration the United States Government owned nickel mining and processing facilities located on Lengua de Pajaro Peninsula, Lavista Bay, Oriente Province, Cuba. The plant is equipped to produce 5,000 tons of wet nickel ore per day (about 3,600 tons of dry ore), and 2,666,666 pounds nickel oxide per month. The facilities cost \$35,000,000.

### **Copper and Copper-Base Alloy Deliveries**

The Industrial Statistical Division and Commerce Department's Census Bureau, jointly revealed that the deliveries of copper and copper base alloy products amounted to 2,815,600 short tons in 1942 as compared with 3,218,700 short tons in 1943, with 2,943,000 short tons in 1944, and with 2,399,600 short tons in 1945. The 1946 figures are not available at this writing.

### **Antimony Demand Exceeds Domestic Output**

The Civilian Production Administration has revealed that the domestic production of antimony will not be sufficient to supply the domestic needs for 1947. At the present rate of consumption there will be a deficit of 8,000 tons which must be largely drawn from the dwindling stockpile of the Office of Metals Reserve.

### **Commerce Department Takes Last of CPA Functions**

The office of Materials Distribution of the Department of Commerce has taken over the relatively few remaining functions of the liquidated Civilian Production Administration. Chemicals will be handled by Frank E. Bennett and metals by Frank H. Hayes.

### **Tin Order Amended**

Conservation Tin Order M-43 was amended on May 1, 1947 under the headings of inventories, import restrictions, reports on customs entry, export certificates, Schedule II—Solders, Schedule III—Babbitt, Schedule IV—Brass and Bronze and Schedule VI—Tin Plate, Terne Plate, and Terne Metal.

### **Zinc Faces Increasing Competition from Substitutes**

E. F. Lundsén, metallurgical engineer of the Inland Steel Company, at the annual meeting of the American Zinc Institute warned members that zinc faces increasing competition from other metals and plastics.

### **Silver Production in March**

The Interior Department's Bureau of Mines reports that the monthly rate of silver production in March, 1947, was the largest since 1945.

### **Electro-Galvanizing of Heat-Treated Steel Wire Found Uneconomical**

According to a report called "Steel Wire: Notes on German Wire Drawing and Steel Rope Manufacture" the electro-galvanizing of heat-treated steel wires

for use in the making of wire rope in a German plant proved to be uneconomical and less satisfactory than the production of wire rope by other methods.

### **Tin Outlook Dark**

Government experts are of the opinion that the outlook for tin is dark because of the vanishing Government tin stockpile, because the importation of tin from the Far East is not satisfactory, and because of the difficulty of coming to agreement with the Bolivian tin producers.

### **Truman Signs Portal-to-Portal Bill**

When President Harry S. Truman signed the Portal-to-Portal Act of 1947, (1) it put an end to such annoying lawsuits like that of Alfred Ravenelle of Woonsocket, R. I., who brought suit against Walsh-Kaiser, Inc., for \$5,000 in portal pay, because as he claimed, it took him 50 minutes a day to climb and descend 65 feet, the distance from the ground to the cab of the crane he operated; (2) it saved some employers from bankruptcy; (3) and it relieved many employers from the liability of pay-claims (growing out of the Mount Clemens, Michigan, Pottery Case), which totalled \$5,785,204,606 as of January 31, 1947.

In other words among other things, this Act prohibits existing and future claims for portal-to-portal pay claims unless they are specifically provided for in labor contracts; it places a two year limit on the filing of claims under existing wage and hour laws; it permits employers to plead "good faith"; and it forbids the filing of group claims unless written authority has been obtained from each of the claimants.

At the time of signing this measure President Truman made this observation: "Business will now be able to plan with assurance, for full production and price reductions. This will be of real value to labor and management in a continued high level of employment."

The President then urged Congress to amend the Fair Labor Standards Act so that the minimum wage standard will be increased from 40 cents to 65 cents per hour.

At least one dark cloud appears on the horizon since the Portal-to-Portal Act has been signed by President Truman. Madame Rumor has been broadcasting, and we hope she is wrong, that the President signed the Portal-to-Portal Act as part of a political scheme. The tales of Madame Rumor report that the President was told that his political future would be safer by signing the Portal-to-Portal Act and by vetoing the Labor bill which will soon be sent to him by Congress.

### **The Destiny of the U. S.**

At the 35th annual meeting of the Chamber of Commerce of the United States, Earl O. Shreve, vice-president of the General Electric Company, and newly elected president of the United States Chamber of Commerce, among other things made this observation: "The destiny of America is to pioneer, to grow, to create, to achieve. The spirit of America is enterprise. Our heritage is freedom. With these . . . and the God-given resources of this broad land, . . . and the opportunities before us, . . . America will rise to new heights of greatness."



# Patents

## Abrasive Manufacture

U. S. Pat. 2,418,282. John A. Williamson, assignor to The Carborundum Company, April 1, 1947

The method of making flexible fibrous abrasive web material which comprises forming a fluid aqueous suspension of cellulosic fibers and abrasive grains, agitating said suspension to gelatinize said fibers by the mechanical hydration thereof and incorporate the abrasive particles intimately therewith whereby the abrasive particles are substantially all retained uniformly in suspension, continuously collecting said suspension upon a suitable foraminous support, extracting water therefrom, and drying and compacting the web to the desired density.

## Nickel Recovery

U. S. Pat. 2,415,665. Albert Edward Wallis and De Witt Henry West, assignors to The International Nickel Company, Inc., Feb. 11, 1947

A process for purifying cobaltic hydroxide precipitates containing nickel which comprises digesting cobaltic hydroxide precipitates containing nickel successively with cobalt salt solutions of increasing cobalt to nickel ratios, said cobalt salt solutions having a pH of approximately 1.5 to 2.0, so as to obtain a purified cobaltic hydroxide precipitate.

## Electroplating Nickel

U. S. Pat. 2,417,203. Richard O. Hull and Raymond A. Hoffman, assignors to E. I. du Pont de Nemours & Company, March 11, 1947

An aqueous nickel plating bath of the nickel sulfate-nickel chloride type in which the chloride anion and sulfate anion are in the ratio of from 5:1 to 20:1 containing about from 0.001 to 5.0 grams per liter of a bath-soluble sulfurized gelatin.

## Manufacture of Rectifier Discs

U. S. Pat. 2,417,839. Edward Arthur Richards, Leslie James Ellison and Frank Gray, assignors by mesne assignments, to International Standard Electric Corporation, March 25, 1947

A process of manufacturing a plural-

ity of selenium rectifier elements from a base plate provided with a selenium coating which comprises the following steps: punching out a plurality of holes corresponding to the holes in the elements to be made, applying insulating enamel to the selenium coating to cover a small area around each hole, subjecting the base plate to heat treatment to convert the selenium to its rectifying condition and to bake the enamel, applying an adhesive paper mask having holes slightly smaller than the elements to be produced to the selenium coating, inserting masking pins in the holes, spraying the base plate with counter-electrode metal covering the mask and the exposed selenium surfaces, subjecting the base plate thus coated to an electrical forming process, severing the elements with a peripheral rim of paper and finally removing said rim of paper leaving the edges of the elements free from counter-electrode metal.

## Rubber Abrasive Article

U. S. Pat. 2,418,249. Charles E. Drake, assignor to United States Rubber Company, April 1, 1947

An abrasive article comprising abrasive grains and a bond containing the vulcanization product of a mixture of rubber, sulphur in amount to vulcanize said rubber to hard rubber and an organic polysulphide polymer plastic selected from the group consisting of polymers of one of the repeated structural units  $[-C_2H_4-S_4 \text{ to } 6-]$ ,

$[-C_2H_4-O-C_2H_4-S_2 \text{ to } 6-]$  and  $[-C_2H_4-O-CH_2-O-C_2H_4-S_2 \text{ to } 6-]$

## Continuous Cleaning and Pickling Device

U. S. Pat. 2,418,386. Frank J. Wood, assignor to Goodman Manufacturing Company, April 1, 1947

In an apparatus of the class described, a trough, a plurality of grid blocks disposed along said trough for slidably supporting an article above the bottom of said trough for treatment as it passes along said trough, and means for directing a treating solution to flow across said trough at a high velocity with a whirlpool action at a plurality of places along said trough, above and below the path of travel of the article being treated through said trough, including a plurality of fluid conducting pipes entering said trough along one side thereof above and below the horizontal plane

in which the material supporting surfaces of said blocks lie, and adapted to discharge fluid under pressure into said trough in a transverse direction with respect thereto, and other pipes entering said trough along the opposite side thereof from said first mentioned pipes above and below the horizontal plane in which the material supporting surfaces of said blocks lie, for discharging fluid under pressure into said trough in a transverse direction with respect thereto.

## Selenium Rectifier Element Treatment

U. S. Pat. 2,418,055. Cleveland Scudder Smith, Jr., and Leonard A. Seder, assignors to General Electric Company, March 25, 1947

An apparatus for treating rectifier elements comprising the combination of a treating chamber provided with charge and discharge ports open to the atmosphere, a mixing chamber having an air inlet opening, a heater in said mixing chamber, a conduit connecting said chambers, means for producing a substantially liquid-free mixture of a gaseous oxidizing agent and air in said mixing chamber to produce a desired surface condition on rectifier elements, and a conveyor for introducing elements to be treated into said treating chamber and discharging said elements from said chamber after a predetermined time interval.

## Electrodepositing and Heat-Treating Molybdenum-Oxygen Deposits

U. S. Pat. 2,417,133. Ernest W. Schweikher, assignor to E. I. du Pont de Nemours & Company, March 11, 1947

In a process for the production of an adherent, abrasion-resistant electrodeposit, the steps comprising electrodepositing a cathode deposit of an oxygen compound of molybdenum at a current density of about from 1 to 15 amperes per square foot from an aqueous acid bath including boric acid, a soluble nickel compound, and a soluble molybdenum compound selected from the group consisting of sodium molybdate, potassium molybdate, ammonium molybdate, and molybdic oxide, the amount of molybdenum present, calculated as metal, being from 7 to 150 grams per liter, and heating the deposit to a temperature of about from 90 to about 400° C.

# Shop Problems

Abrasive Methods—Surface Treatments—Control  
Electroplating—Cleaning—Pickling—Testing

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

## Electrolytic Polishing

**Question:** Please advise us, where we can obtain up to date information regarding the practical application of electrolyte metal polishing on brass or steel. Are there any text books on the subject?

J. R.

**Answer:** There are no textbooks that we know available devoted exclusively to electrolytic methods. An article by Otto Zmeskal appeared in the July, 1945 issue of *Metal Finishing* and contained information on the process together with a complete bibliography of papers in the literature. Unfortunately, we do not have extra copies of this article; you might find it in your Public Library. The *Plating and Finishing Guidebook* for 1945 contains information together with formulas for polishing all types of metals. The Battelle Development Co., Columbus, Ohio, hold basic patents on various processes and they license Hanson-Van Winkle-Munning to manufacture the equipment for use with the process.

## Stripping Zinc Die Castings

**Question:** Do you have information about an efficient stripper for a zinc plate? On Zinc die castings, we plate first with copper, then nickel and chrome—as yet we have found no suitable stripping solution.

D. V. G.

**Answer:** Both the chromium and nickel may be stripped by using a relatively concentrated solution of sul-

furic acid in which the work is made anode at full line voltage. The concentration varies from 93 per cent (66 degrees Be) to about 50 percent (41 degrees Be). The acid absorbs moisture from the air, hence the bath tends to become dilute. Lead lined equipment should be used. Many platers add glycerine in the order of one gallon to a hundred gallons of solution. The best method of removing the copper is to buff or polish it off to the raw zinc die-casting. Most baths that strip the copper quickly and effectively are harmful to the surface of the die-casting.

## Solution Purification

**Question:** I have a drum of Potassium cyanide which has picked up moisture while in storage, causing the inside of the drum to rust to such an extent that the cyanide is literally full of rust particles. Will the use of this cyanide in my silver solution cause trouble by the introduction of iron in the rust form? It seems very difficult to filter out.

There is an excessive amount of chlorine in the local water supply which we use for rinsing, what can I do about it?

J. A.

**Answer:** Do not use KCN with rust in your silver solution. If necessary discard the contaminated salt but we suggest that you dissolve the salts in water and filter through activated carbon.

Regarding an excessive amount of chlorine in your local water supply

used for rinsing, the water can be run through ion-exchange purification equipment.

## Tank Materials

**Question:** A manufacturer of 18-8 Standard, type 302 stainless steel, recommends this metal as a tank material for electroplating solutions of the following types:

Chromium

Copper-cyanide, copper-sulphate

Mercury-cyanide

Nickel-plating solutions

Silver-cyanide, zinc-cyanide, zinc-acid in fact all alkaline plating baths and mixed nitric and sulphuric acid dipping baths. Will you please check this for me?

S. R.

**Answer:** In the industry, the following type baths are used with tanks made of the indicated materials:

Chromium: antimony-lead or tin-lead linings over steel.

Copper-cyanide: steel.

Copper-sulphate: asphalt lining over wood if solution is operated at room temp.; lead lining over wood if solution is operated hot.

Mercury-cyanide: steel.

Nickel plating solutions: rubber or synthetic resin linings over steel.

Zinc-cyanide: steel.

Acid-zinc: rubber, synthetic resin or lead linings over steel.

In general, alkaline plating baths are used in steel tanks while mixed nitric and sulfuric acid baths are used in stoneware containers.

## Electropolishing Nickel-Silver

**Question:** To lessen the burden on our disposal set-up, as well as to decrease chromium consumption, we would like to electro-polish our nickel silver wire with an alkaline electropolishing bath.

The wire is discolored with a slight film of oxides resulting from an annealing pass. I can remove the oxides in such a bath but the wire will have only a slight lustre. Now can you

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recommend a formula or a preparation to do the job?

Contacting various cleaner suppliers has produced no solution to the problem and the time is now ripe for an answer as it may mean an instantaneous savings to our company because a decision must be made on the enlargement of our present disposal set-up.

R. A. B.

*Answer:* An effective formula for electropolishing nickel-silver is as follows:

Sulfuric Acid	33% by weight
Glycerol	33% by weight
Water	34% by weight

96 degrees F; 1,000 to 2,000 amp./sq. ft.; 10 seconds.

For such a bath you would naturally require an acid-resistant container. Note the high current-density and the short time cycle; this lends itself ideally to a continuous roller type feed set-up. As the work is the anode, impurities will rapidly pile up in the solution, hence filtration, cleaning and constant control of the bath is recommended for effective results. Would suggest a small pilot plant setup to determine exact current density and time requirements; under proper conditions, this should remove the oxides and give you a bright clean wire.

#### Aluminum Treatments

*Question:* Could you give me any information on Electropolishing and anodizing of Aluminum. Could you tell me where I could get this information?

C. B.

*Answer:* An effective method of electropolishing aluminum as done experimentally by Sam Tour & Co., Inc., 44 Trinity Place, N. Y., is as follows:

Sulfuric acid	40%
Phosphoric acid	40%
Water	20%

200 degrees F, 5 amp./sq. inch; 5 minutes.

For anodizing, there are several methods now in use utilizing both sulfuric acid and chromic acid methods. A copy of the *Plating and Finishing Guidebook* will show you the processes in detail.

#### Tumbling Adhesion

*Question:* We tub about 10,000 brass units at a time like sample at-

tached in a solution made of #034 Pumice and water.

The result with respect to the smoothness of the metal is satisfactory, but approximately 20% of the units tend to and do double-up, triple-up and quadruple-up. Thus pyramided-up the units have to be separated by hand. We have tried to prevent this—with little success—by the use of Cyanide Eggs to make the solution very slippery.

J. A. S.

*Answer:* As the parts are removed from the tumbler, they may be dipped in boiling or near boiling clean water for a long enough period to heat the parts through; by drying either in an oven or a centrifuge, the adhesion may be eliminated. Another method might be to put ribs in the insides of the tumbler; in this way, many times parts are kept from adhering to one another. Still another suggestion is to contact any tumbling compound supplier, who may have a compound to correct your problem.

#### Scale Removal

*Question:* How do you get the black scale off white metal of the work I do which is refinishing on old Hureso-grace, such as coffeepots, tea pots, sugar creamers, etc., platters pot, metal brittania, etc.

R. F.

*Answer:* You are no doubt referring to pewter ware, brittania ware and general lead-zinc-tin alloys. Evidently the black scale and spots are oxides of these metals. Oxides of such nature can be dissolved by dipping the parts in a solution of concentrated muriatic acid, rinsing thoroughly, then wet scratch brushing with pumice. The usual pre-plating cleaning cycle may then follow.

#### Stripping Chromium

*Question:* We are at times called upon to strip chrome from brass and bronze hardware in order to repolish it, rebuff it for refinishing.

We do not have the facilities to depilate these items and we wonder if you can tell us if there is any dip that we can use that will dissolve the chromium without pitting the metal surface.

L. J. F.

*Answer:* Chromium may be dissolved from brass or bronze by treatment with warm dilute hydrochloric

acid, using one part by volume of concentrated acid to ten parts of water. This solution will strip chromium from nickel and nickel plated parts also.

To remove both nickel and chromium from brass and bronze, a 90% solution of sulphuric acid may be used. Room temperature, reverse current 6 volts, lead cathode.

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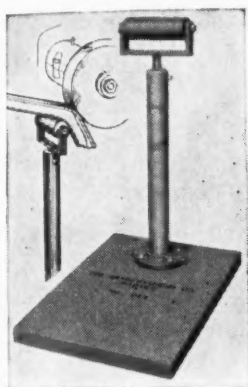
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### Polishing Work Support Roller

New ease and speed in polishing long, heavy pieces is provided by the Presto Work Supporting Roller developed by The Manderscheid Com-



pany, Dept. 100-MF, 810 Fulton St., Chicago 7, Ill.

The unit consists of a rubber roller, 8½" long x 3" diameter, mounted on a large portable base. Height adjustment from 32" to 40" in combination with the portable base affords a quick set up for polishing long, heavy pieces.

Complete information is available on request to the manufacturer.

### Plastic Buffing Compound

Gamco eliminates the necessity of sanding and is said to contain only the finest precision ingredients. It is designed to polish plastic articles directly from sawed or routed surfaces with speed and economy and, in most cases, perfect results. It is made exclusively for plastics—especially acrylics.

The article to be polished should be pressed against wheel lightly or heavily depending on how much grinding is necessary to get rid of saw marks, scratches, and honeycomb holes.

The compound is said to give best results when used on a cloth buff wheel. Apply while buffer is in motion—evenly glazing the surface of the wheel with the compound. A cloth wheel alone may burn the plastic, but with

Gamco on it, burning is impossible, according to the manufacturer.

After polishing, a brilliant sheen results when article is lightly shined with flannel cloth or on a clean fluff buff.

For further information write Great American Color Company, Dept. MF, 2512 W. 9th St., Los Angeles 6, Calif.

### Burn-Off Rust-Proofing with Infra-Red Rays

The introduction of the Burdett Infra-Red Gas-Fired Burners a few years ago proved a major advance in many heat processes. It is said to have virtually revolutionized drying, baking, cooking, etc., with as much as 75% savings in time and cost, and in many cases with improved product as well.

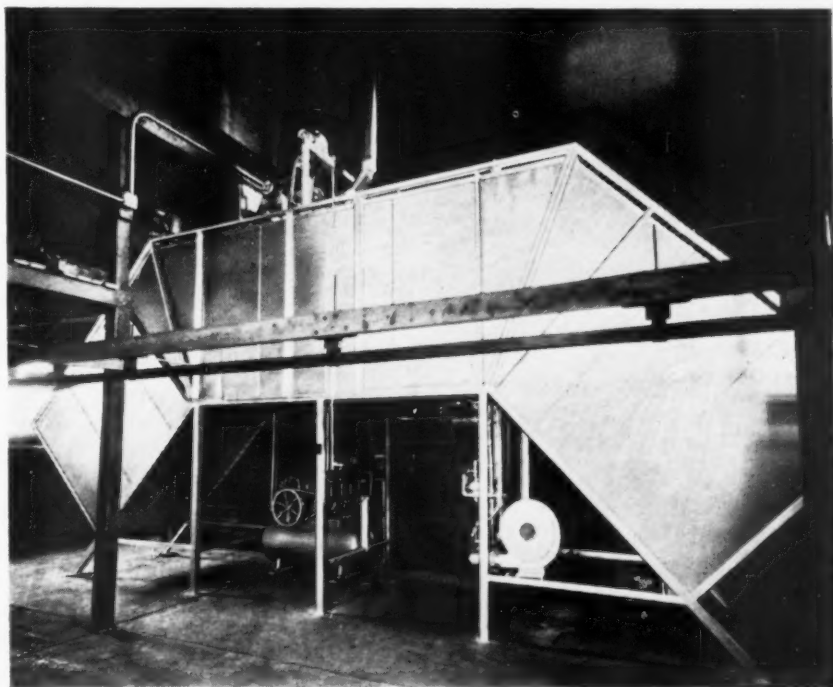
Continued experiments on the part of the burner manufacturer soon made it apparent that degreasing also could be accomplished with infra-red. More than twenty ovens had been installed in some of the largest plants in the country. For example, the most outstanding installation from the standpoint of technical proof and information was in a large Minneapolis plant

in which an infra-red burn-off oven replaced an alkali wash, two rinse tanks, a phosphate treatment tank and an acid bath.

Convinced that not all advantages of infra-red had been exploited, further research was entered into only to find that the burn-off process could produce a rust-inhibiting surface of claimed superiority to practically all existing rust-proofing methods, with merely a few minor changes. A decided advantage in this new development is stated to be that degreasing and rust-proofing is done simultaneously with a noteworthy saving in time, labor, and equipment. Averagely the entire operation requires approximately five minutes.

It is claimed that this process is so simple that there are no possibilities of "bugs" in the equipment and there is essentially no maintenance of equipment.

The new Burdett Burn-Off Rust-proofing process can generally be stated to be the proper placing of the gas-fired infra-red burners in relation to the work, as determined by scientific standards. As previously stated, this process is claimed to not only



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remove grease and similar film, but simultaneously produce a blue surface on the metal that is extremely rust resistant. This blue surface can be best explained as a tight scale and is said to reach hidden surfaces that are not ordinarily reached by rust resistant liquids, therefore a more thorough job.

Sheets treated by this new process are said to have been tested under severest weather conditions for as long as five weeks without slightest indication of rust. Tests have also been run in acid atmosphere with identical results.

Extensive research and tests have been said to prove that the rust-proofing phase of the burn-off operation can be accomplished only by a radiant

heat burner with proper coverage of the work.

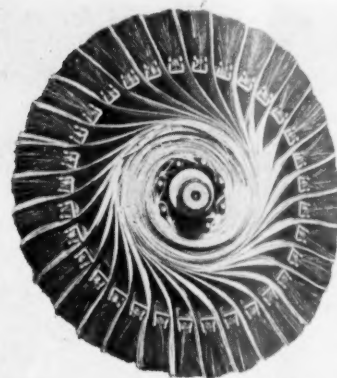
Detailed information may be had by writing direct to the manufacturer, the Burdett Manufacturing Company, Dept. MF, 3433 W. Madison St., Chicago, Illinois.

#### Abrasive Head

A new brush backed sander for use in a multiplicity of operations has recently been developed by the Vonnegut Moulder Corporation.

The combination brush sander and abrasive head is said to be adaptable for sanding, fine finishing, deburring and polishing. Originally designed for wood finishing, the wheel is stated to be in wide demand for deburring and

finishing metal, plastic and other products. The wheel is made up of two principal parts: an outer shell, holding thirty-two replaceable brushes and an inner sleever, or spider, around which are coiled thirty-two strips of abrasive cloth. After being looped over the spider, the abrasive strips are passed between the brushes of the outer shell, extending about one-eighth inch be-



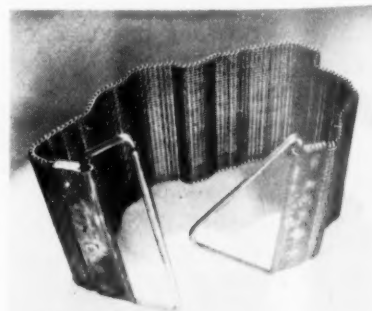
yond the brush ends. There is available a correct grade and grit of cloth for every operation, depending upon the work material and desired finish.

The firm also manufactures spindle stands to meet varying needs. The lathes are especially adaptable for use with the brush backed sander and abrasive head. The units are equipped with 1 or 2 H.P. motors to develop 1200 to 1800 R.P.M. They are sturdily built and have either direct motor drive or 3-step pulley arrangement.

For further information write Vonnegut Moulder Corporation, Dept. MF, 1811 Madison Ave., Indianapolis 2, Ind.

#### Belt Sling for Pickling Bath

A new-type pickling sling has been developed especially for the handling of thin wall tubing in the pickling bath. A product of the Cambridge Wire Cloth Company, Dept. MF, Cambridge, Md., it is patented under the





trade name, "Duplex", and can be used for rod and bar stock as well as tubing.

The sling is of mesh construction with flat, even surfaces that do not protrude to collapse the tubing or scratch the finish. It can be placed around the tubing and hooked into a hoist in one operation. The sling is made in any desired length or width of Monel, Inconel, or other materials to resist the corrosive action of the pickling solution.

The Monel sling illustrated will handle 5 tons of stock for pickling.

#### Water Demineralizing Equipment

A new "Filt-R-Stil" water demineralizer, known as the Model U-60, has recently been developed by the Ion Exchange Products Department of American Cyanamid Company. The Model U-60 is designed to transform ordinary tap water into the chemical equivalent



of distilled water at a small fraction of the cost of distilled water. The ease with which the Model U-60 is operated and maintained is said to offer unique advantages in water treatment; it requires no heat, no steam, no auxiliary equipment, and only enough electricity to light a 6-watt bulb.

The new model, designed to operate at a 60 gallon per hour flow rate, can be used to deliver water containing a maximum of 10 parts per million of ionized solids, or as little as 1 part per million. A "built-in" controller indicates the actual quality of all treated water leaving the unit; no auxiliary analytical tests are required, according to the manufacturer. The controller measures the electrical resist-



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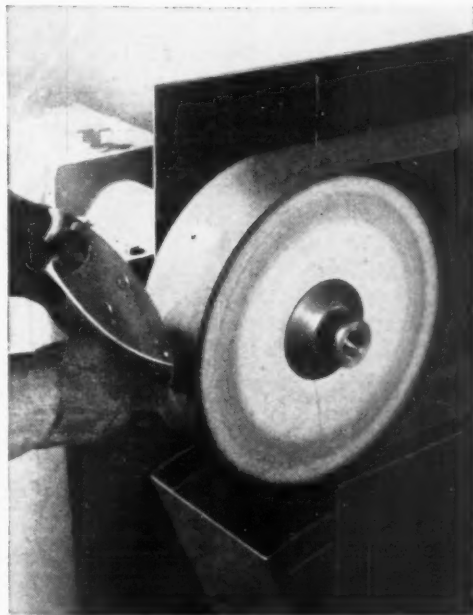
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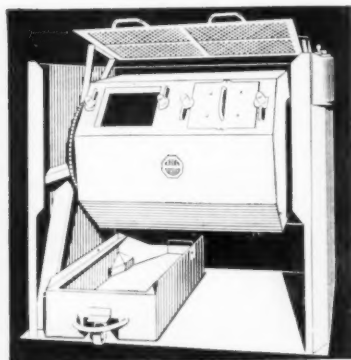
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ance of the treated water; it is an accepted fact that water having a resistance of 50,000 ohms contains not more than 10 ppm of ionized solids, hence the controller is adjusted to actuate a red light as soon as the resistance of the treated water falls below 50,000 ohms.

Four columns containing alternate beds of "ionac" cation and anion exchange resins constitute the bulk of the unit. Water is passed through the four columns in series; the cation resin transforms the dissolved salts present in the raw water into acids, and the anion resin then absorbs the acids. Due to the particular characteristics of resins, which are also manufactured by Cyanamid, the new model can also be used to deliver water free of carbon dioxide; no auxiliary deaeration equipment is said to be necessary.

When the red light on the controller glows, the resins are "exhausted," i. e., they have used up their capacity for demineralization. They are then regenerated, by flowing dilute acid and alkali solutions over them, rinsed, and ready for reuse. These cycles of use and regeneration can be repeated indefinitely. The Model U-60 is completely assembled and ready for immediate operation as shipped and requires only connection to the raw water line, and to drain and electrical outlets.

Other standard demineralizers are available in capacities ranging from 8 gallons per hour to 1200 gallons per hour; larger units are specially designed for the user's particular needs. Further information may be obtained from American Cyanamid Company, Ion Exchange Products Dept. MF, 30 Rockefeller Plaza, New York 20, N. Y.

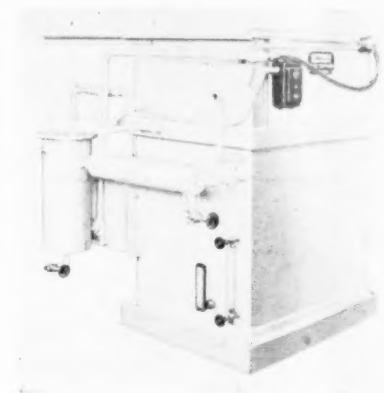
#### Metal Parts Vapor Degreaser

A new standard model vapor-spray type metal parts degreaser has just been introduced by Optimus Equipment Company, Dept. MF, 131 Water St., Matawan, N. J., engineers and manufacturing of metal degreasing, cleaning and drying equipment.

Known as Type OP-1-48, this new degreaser is designed for use with trichlorethylene, with every consideration given for solvent conservation. Unit is fabricated of 3/16" steel plate and reinforced by structural members and all electrically welded. Body of unit and internal auxiliaries are hot dip galvanized after fabrication. Heating and cooling coils, which are de-

signed for maximum efficiency in the complete recovery of solvent, are readily removable for cleaning and maintenance. The unit acts as a still to recover the contaminated solvent, thereby providing a continuous supply of pure distilled solvent for the spray as well as for the vapor phase.

Chips and insoluble impurities and buffing compounds that have been



worked into sharp corners or crevices, are said to be efficiently and quickly removed by the use of a spray of the solvent directed at the work. A hand spray line made of special woven metal hose, is supplied as a special feature for this purpose.

Heat to vaporize the solvent may be supplied by either steam, gas or electricity. Automatic vapor and temperature controls are optional accessories.

Work clearance of this Degreaser is 45" length by 27" width. Overall dimensions are approximately 48" width by 48" length by 60" high. Unit has a capacity of handling 200 lbs. of steel per hour. It is one of a series of standard models being introduced by this manufacturer.

#### Lightweight Full Automatic Plating Machine

The Udyllite Junior full automatic plating machine is said to represent the first attempt to bring mass production methods into the manufacture of plating machines, heretofore considered so highly specialized as to require custom design and construction.

The new full automatic is claimed to have 2000 fewer moving parts than any other full automatic machine. Basically, a full automatic plating conveyor consists of a work carrier that supports the plating rack and conducts the plating current to it. With this new machine, the transfer mechanism has relatively few moving parts and a

novel method of using a pusher bar with air cylinder eliminates all conveyor chains, gear boxes, cams, motors, limit switches, electric time clocks and other devices commonly used in full automatic equipment.

The machine is 27½ feet long, 8½ feet high and 5 feet wide and can be assembled in about 4 hours by three men of average mechanical ability, according to the manufacturer. A 5 H.P. air compressor delivering 90 pounds per square inch pressure is required where compressed air is not available.

The machine has the following plating cycle: electroclean; cold water rinse; acid dip; cold water rinse; electroplate; cold water rinse; hot water rinse; hot air dry; load and unload. 75 to 100 plating racks 24" deep, 6" thick and 12" wide weighing 40 pounds each are said to be capably handled by the unit per hour.

For further information write The Udvite Corporation, Dept. MF, Detroit 11, Mich.

#### Light Duty Polishing Lathe

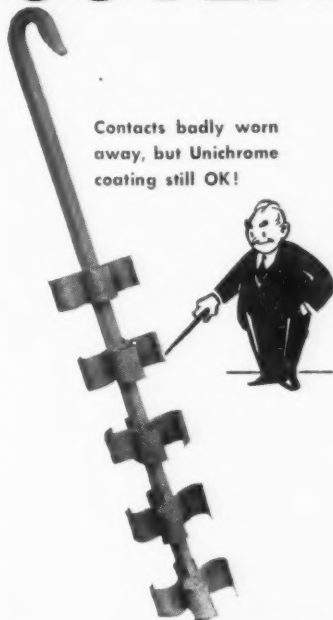
The first model in a new line of polishing lathes for jewelers, plastic manufacturers, platers, foundries, tool rooms and laboratories, is being introduced on a nationwide scale exclusively through the distributing agency of Ralph Hochman & Company. Marketed as Model 400, it is the forerunner of a quintet of polishing lathes of varying sizes and types that are planned for early delivery under the trade name of "Washed Air."

Hochman representatives say the new machine operates at lower cost, in a smaller area of floor space, and with greater efficiency than most polishing lathes of a comparable type. The standard machine is equipped with a self-contained dust collecting unit, and ball bearing 1725 RPM motors of various sizes from ½ H.P. to 3 H.P. of standard current characteristics. These motors operate both the polishing head and dust collecting units. "A"-type link belting is used exclusively.

Manufacturers of the new machine claim that under normal working conditions it collects more dust than any other machine of its character, and thus increases the salvability of valuable pulverized matter. The polishing head and cover tray are of cast aluminum fitted with two sets of

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## Unichrome Rack Coating Still Good After 5,000 Cycles!

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standard ball bearings on which the spindle shaft revolves.

Dust is drawn from the surface of the machine by a 4-inch duct in each collector. A removable receptacle on the intake side of the exhaust fan traps any foreign object and prevents it being drawn into the system. The dust-laden air is cleansed by being passed through water and is returned to the work-room through three louvers in each side of the collector.

Spindles of turned, ground and polished steel shafting are tapered, but can be replaced by the straight type if desired. Each wheel has its own dust collector. A fabric dust-bag, immersed in water, on the exhaust end of the fan housing, can be readily re-





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You can use Wyandotte Burnishing Compound 317 in either hot or cold water—and always get satisfactory results. This viscous liquid contains no soap or inorganic alkalis . . . so the hardness of water does not affect its burnishing action. And it does not form non-rinsable films that may interfere with subsequent operations.

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burnishing with steel balls . . . for burring . . . for combined burnishing and burring with chips or stones. You will find that it brings out a superior luster—whether you use it in open or closed barrels.

Your Wyandotte Representative will be glad to tell you more about the advantages of Wyandotte Burnishing Compound 317. Give him a call at any time.

• We'll see you at the Industrial Finishing Exposition — Detroit — June, 1947.



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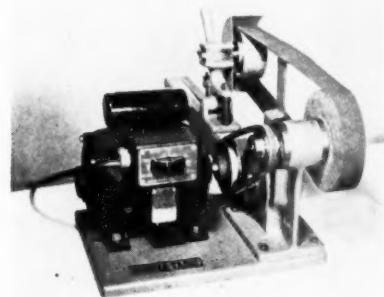
moved and cleaned. A single motor operates all the processes of the machine.

Possibility of eye-fatigue is said to be lessened by covering the working table-top with linoleum and surfacing the machine with green and cream paint. Two foot rests, ample room for two operators at each machine, and brilliant, non-straining lights in the hoods, are other features. The machine is also being used as a grinder as well as a polishing lathe.

For further information write Ralph Hochman & Company, Dept. MF, Newark, N. J.

### Abrasive Belt Utility Grinder

The abrasive belt has now been applied to the utility grinder according to an announcement by Porter-Cable



Machine Company, Dept. MF, Syracuse, New York.

This new machine is said to provide the advantages of grinding on an abrasive belt operating over a resilient contact roll or wheel in a popular priced unit. Since the wear is on the abrasive belt and not on the supporting contact wheel, this wheel or roll remains flat, square at the corner or side, and maintains its diameter and balance. The resiliency of the roll eliminates chatter.

Grinding on the roll quickly reduces the size of stock being ground. This can be squared up on the platen provided immediately above the roll. Grinding inside of a job is done and held flat by working over the edge of the platen.

For grinding and polishing of certain rounded or oval parts, such as scissor handles, an additional formed resilient contact roll can be attached to the grinder in place of the platen.

Work is also done on the free or unsupported abrasive belt, such as grinding contours, following a pattern or grinding or cleaning up in other-

wise inaccessible places; for instance, grinding the tines of forks. When an intricate pattern is followed, such as grinding off the parting line of a plastic hand form for displaying gloves, the abrasive belt is scived about  $\frac{1}{4}$ " and the bare cloth remaining acts as a lead to guide the belt around sharp corners and the remaining abrasive grinds.

The abrasive on a belt is fully exposed for work, which increases cutting efficiency and reduces effort. This new grinder is adjustable  $90^\circ$ .

#### Solvent Emulsion Type Detergent

A new solvent emulsion type detergent, Wyandotte Emlon, for use in the metal finishing industry has been announced by Dr. Roy Heath, manager Industrial Department, Dept. MF, Wyandotte Chemicals Corporation. This product is said to be a unique combination of organic solvents and emulsifiers and lend itself to the formation of unusually stable emulsions even in the presence of acids, alkalies and other electrolytes.

The experiences of Wyandotte service engineers have shown this product to be exceptionally effective and economical in a wide variety of applications—in power spray washers, pre-soak and still tanks, for cleaning prior to phosphatization, and as an adjunct to acid or alkali cleaners, according to the manufacturer. In addition to many other uses where an emulsifiable solvent is desired, Emlon is added to stamping and drawing compounds to facilitate their removal.

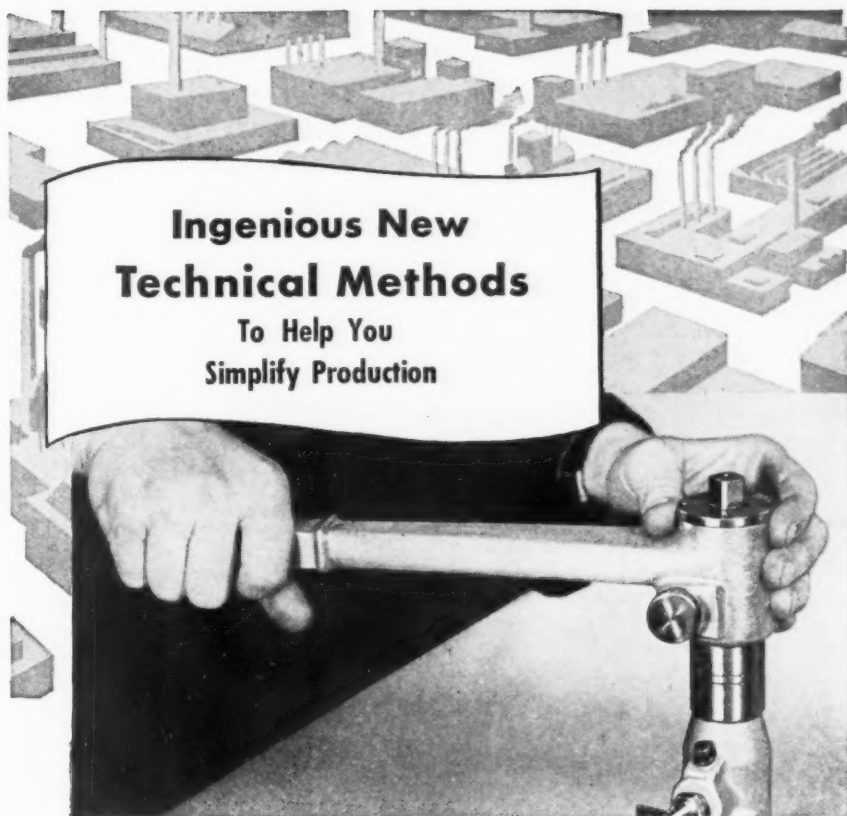
The detergent can be safely used on ferrous as well as non-ferrous surfaces. Its high-boiling and non-foaming characteristics provide longer cleaner life in addition to making it easy to use, it is claimed. Package sizes are 5 gals., 15 gals., and 55 gals. drums.

#### All Purpose Stop-Off Lacquer

Announcement to the trade of the availability of Kote-Masq, a stop-off lacquer designed for use in all types of electroplating and anodizing solutions is made by the Hanson-Van Winkle-Munning Company.

The result of extensive research and embodying the latest synthetics now available to industry, it is claimed that production tests have proved Kote-Masq superior to ordinary stop-off, particularly in providing positive adhesion at the edges. The material

## Ingenious New Technical Methods To Help You Simplify Production

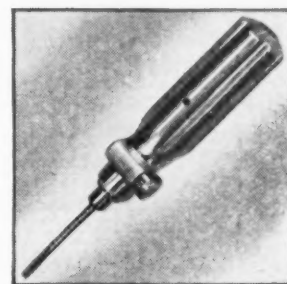


## New Type of Torque Tools Incorporate Spring Clutch! . . . Are 98% Accurate!

**Acme Torque Wrench** and **Screw Driver** both incorporate spring clutches, with easily operated control. After setting control to desired torque, the operator merely turns tool in the usual way. When the torque required to drive the threaded part exceeds the pre-set value, the tool slips. Impact doesn't cause driving torque to increase. Oil doesn't affect setting which is reproducible within 2% or better.

**The Wrench** offers right and left-hand drive, ratchet action and withdrawal. Spring clutch may be set from 0 to 500 inch pounds. Standard sockets are interchangeable. The **Screw Driver** may be set for any value of torque from 0 to 35 inch pounds. A ratchet action is incorporated. The same tool will also withdraw screws. Standard bits, including socket types, may be easily inserted. The tool is made of pressure cast aluminum.

**Another Time-Saver** on the job, is chewing gum. The act of chewing aids the workers' concentration—seems to make the work go easier. Chewing gum may be used even when workers' hands are busy; reducing interruptions from the job. For these reasons many plant owners have made Wrigley's Spearmint Gum available to everyone.



Torque Screw Driver



You can get complete information from  
Acme Scientific Company,  
1450 W. Randolph St., Chicago 7, Ill.

AB-66

# EXOLON

IS THE ABRASIVE

## For Fast Metal Polishing



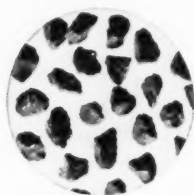
### Accurate Grades... Iron Particles Removed

Exolon Aluminum Oxide Abrasives are available for polishing all types of metals.

The special production facilities at the new Exolon plant provide unsurpassed uniformity of grading (size and shape) in all standard sizes; thus assuring fast and satisfying polishing results.

Due to its greater freedom from magnetic particles, Exolon is a more efficient grain for polishing stainless metals... a safer material to use since ferrous materials will not become embedded in the surface.

Write for Exolon's folder on polishing procedures and recommendations.



*Photomicrograph of  
Exolon RST Polishing  
Grains.*

## THE EXOLON COMPANY

945 E. Niagara St.

Tonawanda, N. Y.

Manufacturers of SILICON CARBIDE and ALUMINUM OXIDE ABRASIVES

may be applied by dipping, brushing, or spraying and besides being exceptionally effective in electroplating and anodizing solutions, it is said to give the same results in strong electrocleaning solutions.

Two coats a half hour apart are generally applied to a clean and dry surface. The stop-off may be readily removed by chlorinated solvent liquid or in a vapor degreaser.

For more information write to Hanson-Van Winkle-Munning Company, Dept. MF, Matawan, N. J.

### Drying and Burnishing Equipment

The Boland line of boxes for use in drying parts by means of sawdust has recently been made available. The boxes are of galvanized steel and have a roll top to prevent fire. The cover is said to keep all dust and dirt out of the sawdust.

The jewelry and novelty burnishing machine made of wood is also announced as available. The machine consists of an outer wooden tank and an inner tub with eccentric shaft for rotation of the work, the tub being removable and pulley-driven.

For detailed information write the manufacturer, H. J. Astle & Company, Inc., Dept. MF, 118 Orange St., Providence, R. I.

### Ear Plugs

Ear Defenders, made by Mine Safety Appliances Company, are said to provide a simple, inexpensive means of excluding excessive noises while permitting speech and warning signals to be heard—thereby increasing working efficiency and preventing fatigue caused by loud, distracting sounds.

The Ear Plug is essentially a tapered tube molded from a soft, non-toxic, elastomeric material with an inner septum for filtering harmful noises. A soft, resilient flange surrounding the Defender's inner end is claimed to provide comfortable fit and complete closure of the ear canal.

According to the manufacturers, the Ear Defenders have been developed in accordance with established acoustical principles. They are claimed to be comfortable to wear, sanitary, and easy to insert and remove.

Write for the new Bulletin No. HA-3 to Mine Safety Appliances Company, Dept. MF, Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.



### Seven Tube Heat Exchanger

Seven tube graphite shell and tube heat exchangers for use under highly corrosive conditions are now available from National Carbon Company, Inc., Dept. MF, New York, in three standard sizes of 4'3", 7'3" and 10'3" length. All three units employ 1" I.D. x 1 1/2" O.D. "Karbate" tubes in bundles encased in standard 6" I.D. steel pipe shells. The exchangers are identical in every respect except for pipe length and the number of baffles, and all tube bundles and shells of the same size are interchangeable.

The units can be employed as heaters, coolers, boilers or condensers, and can be operated vertically or horizontally. They will carry temperatures up to 338° F. (170° C.) and a working



pressure of 50 lbs./sq. in. on both the tube and shell sides. Standard nozzle connections permit ready installation with piping connections of almost any material of construction. Water, brine or steam are suitable on the shell side.

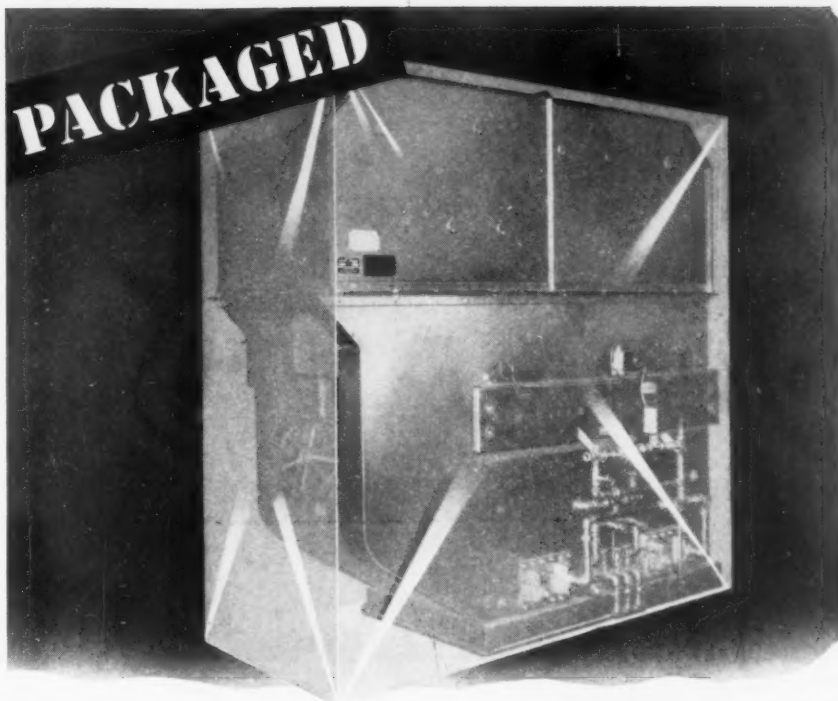
"Karbate" Impervious Graphite is claimed to have the well-known properties of high thermal conductivity (three times as high as carbon steel) and resistance to the action of most acids, alkalis, and other corrosive, solvent or reducing agents—particularly to all concentrations of hydrochloric acid and nearly all concentrations of hot sulphuric, phosphoric, and acetic acids, wet chlorine and the organic solvents.

The 4'3" size has 8.2 sq. ft. of effective outside tube area, the 7'3" size 16.4 sq. ft. and the 10'3" size 24.6 sq. ft. A unique feature of their construction is the combination of tube sheet, dome and nozzle into one monolithic piece, which eliminates packed joints for the corrosive liquid and reduces the number of gasketed joints on the fluid side to one gasket at each nozzle.

### Rust Preventive

The need for drying of metal parts before applying rust preventive is said to be eliminated by a new solvent type rust inhibitor developed by the U. B. Bray Company, Los Angeles, Calif., according to an announcement made

**PACKAGED**



## BIG DEGREASER ADVANTAGES In Small Units

That's right! The Detrex 2DC500 packages big degreaser advantages in small units—ideal for shops needing production cleaning in limited space. Look at these four-star advantages:

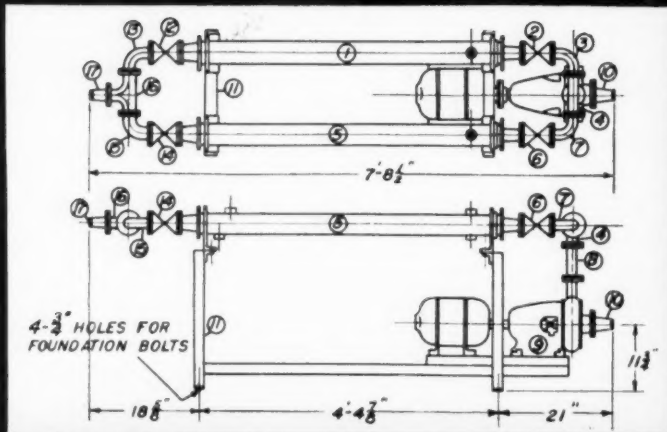
- ★ **Flexible**—a choice of degreasing cycles . . . including boil-rinse-vapor, vapor-rinse-vapor and other variations
- ★ **Capacity**—One ton to many tons of steel per hour (depending on size)
- ★ **Controlled economy**—conveyorized to conserve solvent and cut operating expenses
- ★ **Minimum floor space**—units range from 7 by 9 feet to 9 1/2 by 14 feet

**Eliminate Cleaning Department Bottlenecks**—The 2DC500 is spotted in a strategic location in many industrial plants so as to be accessible to several departments and provide for full capacity operation. When a variety of metals are cleaned in a degreaser, PERM-A-CLOR—the highly stabilized solvent, marketed only by Detrex—is recommended. For ferrous metals only, it's TRIAD.

Let us tell you more about our complete line of standard solvent vapor degreasers. Write today.

E 164





## Equipment for heating or cooling PLATING AND ANODIZING SOLUTIONS now supplied in a complete unit

**S**tandard DURCO units available with 1 to 9 or more heat exchangers in banks—and all valves, pipe, fittings and pump—supported by one frame.

Equipment in contact with the corrosive is Duriron, a high-silicon iron with extreme resistance to corrosion from bright nickel and chrome plating solutions, anodizing solutions and many other corrosives. Easy to remove any heat exchanger without complete shutdown.

Units are assembled and parts marked before disassembly for shipment. Bolts, gaskets and all parts included.  
Write for Folder T.



**THE DURIRON CO., Inc.**  
DAYTON 1, OHIO, U. S. A.

### Assembly No. 241B2

- 1 #4 Heat Exchanger
- 2 1" Valve
- 3 1" 90 deg. S. F. Elbow
- 4 1" x 1" x 1" S. F. Tee
- 5 #4 Heat Exchanger
- 6 1" Valve
- 7 1" 90 deg. S. F. Elbow
- 8 1" x Approx. 6" lg. Pipe
- 9 1 1/2" x 1" Durcopump
- 10 1 1/2" S. F. Hose Connection
- 11 Support
- 12 1" Valve
- 13 1" 90 deg. S. F. Elbow
- 14 1" Valve
- 15 1" 90 deg. S. F. Elbow
- 16 1" x 1" x 1" S. F. Tee
- 17 1" S. F. Hose Connection for 1 1/2" Hose

35-GM

by Dr. Ulric Bray, who heads the company.

A major feature of this new rust preventive, Brayco-150, is said to be its exceptional ability to displace all traces of moisture from metal surfaces. Due to a high affinity for metal, it penetrates underneath water to the metal, forcing water to drain off, and then preventing it from again adhering. Thus, Bray Company engineers state, parts may be removed from any kind of bath—neutralizing, washing, pickling, etc., and dipped or sprayed with Brayco-150, after which all moisture will run off. No drying steps are necessary, prior to dipping or spraying.

Brayco-150 consists of a film-forming, non-volatile base dissolved in a petroleum solvent. The solvent evaporates, leaving an oily film which resists corrosion caused by heat, cold, humidity and salt water. Only a thin film is reportedly needed for protection lasting from 6 to 12 months indoors, and for a limited time outdoors.

It is applied by spray or dip, and may be left on before brush or dip painting.

Detailed information is available from the U. B. Bray Company, Dept. MF, 3344 E. Medford St., Los Angeles 33, Calif.

## Rust Remover

Another war production development hailed by its producers as a new "miracle" chemical, is a liquid rust remover produced by Allied Products Company, 1133 W. Newport Street, Chicago, and marketed under the name CorOdex. Claims for the new rust remover are that it is amazingly effective on any metal surface, that it will remove even the thickest coat of rust, that it is so penetrating it reaches pin point spots, pits, crevices, cracks or corners and that it can be applied in a minimum of time with a paint brush or cotton swab.

Other claims are that it requires no rubbing, is non-explosive, non-inflammable, and will not injure metal or the hands of the user.



The makers say that the action of their material is rapid and that after treating the corroded surface, either by hand application or by dipping, it will dissolve light rust in a few minutes, while longer applications will remove a coating of rust up to one quarter inch thick. The article may then be wiped with a clean, dry cloth. Long immersion leaves the surface with a blue-black oxidized finish which materially increases its resistance to further rusting.

Allied Products Company has prepared a rust control manual of information and instructions. Readers may secure a copy by writing Allied Products Company, Dept. R148, 1133 W. Newport St., Chicago 13, Ill.

## Anti-Corrosive Organic Finish

P-5, a new anti-corrosive co-polymer finish, is a series of coatings designed for the protection of metal, wood and concrete against corrosion from exposure to moisture, acids, alkalis and many other disintegrating elements. It was developed for industrial use and placed on the market by Industrial P-5 Division, The Watson-Standard Com-

pany, Dept. MF, Pittsburgh 12, Pa.

The new finish is recommended for industrial use where protection against deterioration of surfaces is vital. It can be used on cement, metals or architectural surfaces with equal success. Wherever a non-corrosive fast-drying finish is needed in steel plants, chemical plants, etc., P-5 is applicable, it is stated.

In addition to its chemical resistance, P-5 is said to be free from objectionable paint odors, is non-toxic and dries by evaporation without requiring an oxidation period. It has good thermal stability, is highly resistant to abrasion and scrubbing and has good aging characteristics. P-5 does not oxidize or become brittle, according to the manufacturer.

Proof of the high chemical resistance of P-5 coating comes from actual tests. Films of P-5, .0025 inches thick, were immersed in various reagents for six months. They were found to be unaffected when removed. Some of the reagents used in the tests were 3% acetic acid, 10% sulphuric acid, 10% hydrochloric acid, 10% nitric acid, 29% ammonium hydroxide and 10% sodium hydroxide.

Watson-Standard P-5 is available in nine colors. The manufacturer will furnish complete information on request.

## Manufacturers' Literature

### Coolant and Rust Preventive Data

In a recent announcement sent to metal working plants across the country, *Oakite Products, Inc.*, New York, offered free copies of two informative, illustrated booklets providing many specific production suggestions for improved machining, cutting, grinding and related operations on ferrous and non-ferrous metals and for preventing formation of rust on ferrous surfaces between machining operations.

The first of these booklets discusses the applications of *Oakite Soluble Oil* and *Oakite* addition agents for meeting unusual or special machining problems. The second booklet provides valuable data on temporary or semi-permanent rust protection of ferrous parts or work with *Oakite Special Protective Oil*, following such operations as grinding, machining, pickling,

tumbling, sand blasting, brazing, etc.

Industry personnel and readers of this publication desiring free copies of these two booklets may also obtain them by addressing *Oakite Products, Inc.*, Dept. MF, 154C Thames St., New York 6, N. Y.

### Cleaning Equipment

A catalogue giving information on their complete line of cleaning equipment has recently been made available by the *Mabor Company*.

Illustrated and described are automatic parts washers, cylinder type, turntable, dip agitator, single stage washers. Combination hand degreasers utilizing vapor, dip and spray methods are described, as are convey-

orized units. Infra-red and other types of driers are also included.

To obtain a copy of this catalogue, write the *Mabor Company, Inc.*, Dept. MF, Walnut St., Rahway, N. J.

### Polishing Wheel Information

*Divine Brothers Company*, manufacturers of metal finishing machinery and supplies, announce the publication of two new bulletins.

The first of these bulletins contains brief definitions of buffing and polishing operations, and shows a convenient table for estimating Surface Feet per Minute from RPM for wheels from 4" to 24" in diameter. Recommended wheel speed for the various operations are shown.

The second bulletin describes the



## Demand Determines Capacity

There is no better indication of the superior quality of Buckingham polishing and buffing compositions than the new, larger Buckingham Products plant—purchased to meet a greatly increased demand.

The new plant is twice the size of the original Buckingham plant which served you so well during the past 12 years.

To serve you even better —with top quality and faster service—our mixing facilities have been greatly increased also.

YOU ARE CORDIALLY INVITED TO  
LOOK OVER THE BUCKINGHAM  
PRODUCTS LINE IN BOOTH NO. 82  
AT THE INDUSTRIAL FINISHING EX-  
POSITION IN DETROIT, JUNE, 1947.

BUCKINGHAM SALES  
AND CONSULTATION  
SERVICE IS AVAILABLE  
FROM COAST TO COAST

## The Buckingham Products Company

14100 Fullerton Avenue • Detroit 27, Michigan



FOR BETTER PLATING... AT LOWER COST

# It's the **VARI-PLATER**\* PACKAGED INDUSTRIAL RECTIFIERS

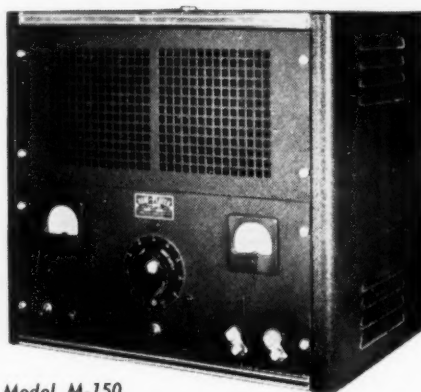
- ★ VERSATILE
- ★ VARIABLE DC VOLTAGE
- ★ INSTANTANEOUS DC POWER
- ★ EXTREMELY COMPACT
- ★ STURDILY CONSTRUCTED
- ★ SIMPLE TO INSTALL
- ★ ECONOMICAL TO OPERATE
- ★ EASY TO MAINTAIN
- ★ FULLY GUARANTEED

For laboratory and production work Lewis Electric offers a complete line of portable packaged industrial rectifiers ranging in output from 8 volts 25 amps to 8/16 volts 500/250 amps, and in size from 10½" x 21" x 15" deep to 42⅞" x 22" x 18" deep.

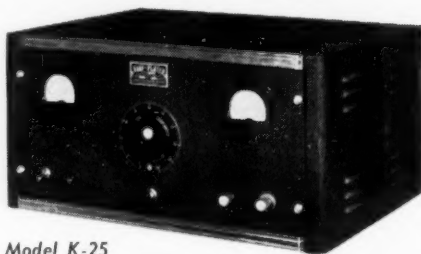
\*REG. TRADE MARK  
FOR MORE INFORMATION WRITE TODAY FOR YOUR FREE COPY OF "LEWIS RECTIFIERS FOR ELECTRO-PLATING."

## FOR PLATING

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|----------------|-----------------------------|
| • GOLD         | • COBALT                    |
| • SILVER       | • IRON                      |
| • CHROMIUM     | • LEAD                      |
| • NICKEL       | • PALLADIUM                 |
| • BLACK NICKEL | • RHODIUM                   |
| • COPPER       | • TIN                       |
| • CADMIUM      | • ZINC                      |
| • BRASS        | • ALLOYS                    |
| • BRONZE       | • On Metals and Non-Metals. |



Model M-150  
0-8 volts—150 amps  
Model MD-150  
0-8/16 volts—150/75 amps



Model K-25  
0-8 volts—25 amps  
Model K-50  
0-8 volts—50 amps

## LEWIS ELECTRICAL MANUFACTURING COMPANY

1266 GUN HILL ROAD, NEW YORK 67, N. Y.

balancing tubes available in *Divine Clothflex Polishing Wheels*—previously standard in the *Compress Wheel* and *Leather Covered Wheel*. On the reverse of the same bulletin are descriptions of eight different wheel hubs available on various wheels. Copies of these bulletins are available by writing Divine Brothers Company, Dept. MF, 200 Seward Avenue, Utica 1, New York.

### Abrasive Methods Bulletins

A new series of bulletins on abrasive techniques has recently been issued by the *Clover Mfg. Company*. The technical information contained in

these papers was written by *E. B. Gallaher*.

Among the items covered in these informative papers are abrasive disc sanders, belt sanding methods, coolants for abrasives, testing coated abrasives, moisture effect on glue-bonded coated abrasives, a handbook of coated abrasive technology.

For copies contact the *Clover Mfg. Company*, Dept. MF, Norwalk, Conn.

### Electroplating Power Supply

Increased profit for electroplaters through the outstanding efficiency and economy of Selenium Rectifier DC power supplies is the subject of a new electroplating booklet published by

Federal Telephone and Radio Corporation, manufacturing associate of International Telephone and Telegraph Corporation and one of the leading producers of Selenium Rectifiers. In addition to describing the economic and operational advantages of Selenium Rectifiers as a plating power supply, this new Federal publication contains a representative series of recommended plating room layouts, complete with diagrams and tables of required power equipment. This booklet, as well as information on specific plating requirements, may be obtained upon request from Federal Telephone and Radio Corporation, Dept. MF, 100 Kingsland Road, Clifton, N. J.

### Rubber Goods

A new four-page catalog section on its Flexite rubber pouring buckets and dippers, used for the safe and economical handling of acids, corrosives, liquid explosives and many other highly active liquids has been published by *The B. F. Goodrich Co.*, Dept. MF, Akron, Ohio, and can be obtained upon request.

Range of applications and instructions on usage are included in the catalog section. The pouring buckets are made in flexible and semi-flexible types, and the dipper of a semi-flexible rubber compound. Hard rubber funnels made by the company also are described.

### Abrasive Blast Cleaning Machine

A completely revised edition of *Catalog No. 214-A* which describes the *Wheelabrator Swing Table* has been published by *American Wheelabrator & Equipment Corporation*, Dept. MF, 555 S. Byrkit St., Mishawaka, Ind.

Detailed information on each of the five sizes including construction features, overall dimension drawings and specifications is contained in the twenty page catalog. In addition, sections of the profusely illustrated catalog are devoted to operating performance facts, ventilation requirements, installation photographs, list of users and design variations available for handling special cleaning applications.

A copy of *Catalog No. 214-A* may be obtained directly from the manufacturer.

### Protective Coating Application Specifications

New application specifications are now available that are claimed to give

proved methods for corrosion-proofing metal and masonry surfaces with *Prufcoat Protective Coatings*. Of especial interest to maintenance, chemical process and construction engineers, these new specifications are said to have been adopted as standard by leading plants and engineering firms throughout the country. The result of over eight years work specifying for difficult corrosion situations in chemical process plants, plating rooms, etc., the specifications give detailed information concerning the preparation of metal and masonry surfaces, as well as the application of *Prufcoat Protective Coatings*. Copies of these new specifications can be secured by writing *Prufcoat Laboratories, Inc.*, Dept. MF, 63 Main St., Cambridge 42, Mass.

## Business Items

### American Buff Company Elects Sax

The election of *Leonard B. Sax* as secretary and treasurer of the *American Buff Company*, Chicago, Ill., was



Leonard B. Sax

recently announced by *Ben Sax*, president of the firm.

Mr. Leonard Sax is a graduate of Northwestern University, holding a bachelor of science degree J.D. After three years of service in the armed forces, Mr. Sax returned to assume his present position.

### Rheem Manufacturing Sells Iridite Division

Announcement is made that the operating management of *Rheem Research Products, Inc.*, *Iridite Division*, have bought the Iridite Division from *Rheem*



# Ready for the Finishing Touch!

... METAL PARTS  
ARE MORE EASILY  
FINISHED WHEN  
CLEANED IN A

# BLAKESLEE

## METAL PARTS WASHER



Write today for FREE booklet on *Blakeslee Metal Parts Washers* to answer your particular cleaning problems.

Whether the finishing operation is enameling, lacquering, machining, plating or inspecting, your washer must do a perfect cleaning job. The *Blakeslee Metal Parts Washer* is especially adaptable for cleaning between operations and prior to inspection . . . Continuous and batch type metal parts washers are familiar equipment throughout the automobile and aviation industries, as well as all other metal fabrication fields.

## G. S. BLAKESLEE & CO.

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS  
NEW YORK, N. Y. TORONTO, ONT.

**BLACOSOLV**  
DEGREASERS AND SOLVENT

**NIAGARA**  
METAL PARTS WASHERS

*Manufacturing Company*. The new division operates as *Allied Research Products, Inc.*

The exclusive right to manufacture and sell *Iridite* in this and foreign countries has likewise been arranged on a royalty basis with *Rheem Manufacturing Company*.

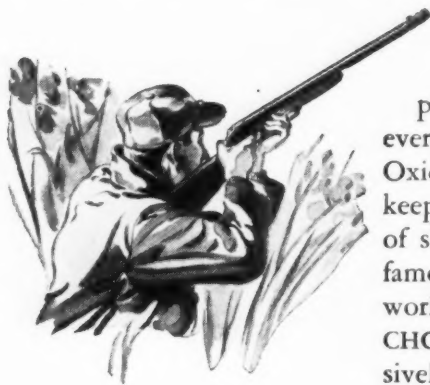
In addition to the manufacturing and selling of *Iridite*, operations will include the manufacturing and merchandising of a line of enameled copper giftware, known as *Ceramicraft*.

Also, a metal finishing job-shop will be operated for electroplating of zinc and cadmium, vitreous enameling, and painting.

### Chicago Wheel & Manufacturing Builds New Plant

A new plant of 6,800 square feet of floor space is being built for the manufacture of grinding wheels and abrasive products in Valparaiso, Ind., by the *Chicago Wheel & Manufacturing Company*.

# DU-LITE BLACK OXIDE FINISH GUARDS THE WORLD FAMOUS POLY-CHOKE



From the sands of Sahara to the damp swamps of the Chesapeake, in every kind of weather in every part of the world DU-LITE Black Oxide Finish protects the Poly-choke, keeps it accurately adjusting the pattern of shot put forth by the world's most famous shotguns in the hands of the world's leading marksmen. The POLY-CHOKE Company uses DU-LITE exclusively in finishing their famous product.

POLY-CHOKE selects DU-LITE because it imparts a beautiful, durable, oil-absorptive finish. Others use DU-LITE because it is quickly imposed at non-critical temperatures; it reduces friction and causes no dimensional change.

DU-LITE will solve your problems in black finishing for steel as successfully as it has solved POLY-CHOKE's. Phone or write for additional information. We will be glad to have a skilled DU-LITE Service Engineer call on you.

## DO IT RIGHT WITH DU-LITE

**DU-LITE CHEMICAL CORP.**  
110 River Rd., MIDDLETOWN, CONN.

Arthur J. Miller, president and general manager, stated that the plant to be built in Valparaiso is to incorporate the latest designs and advances within the grinding wheel industry. Grinding wheels are to be manufactured in their entirety in the new plant.

The firm has been in the abrasive product business in Chicago for over 50 years.

### Optimus Detergents Appoints Edward G. Mansfield

Edward G. Mansfield, of Perth Amboy, N. J., has been appointed field service representative by Optimus Detergents Company, Main Street,



Edward G. Mansfield

Matawan, N. Y., manufacturers of industrial cleaning materials. Mr. Mansfield will cover New York City and Essex, Union and Middlesex Counties in New Jersey.

### Blouch Joins Heil Process Eqpt. Corp.

Howard H. Blouch is now employed in the sales promotion of chemical proof tanks and heating devices for the Heil Process Equipment Corporation, Cleveland 11, Ohio.

This new association follows process engineering for the Van der Horst Corporation, the White Sewing Machine Company, and twenty years of sales engineering for the Electroplating



Howard H. Blouch

Division of the E. I. DuPont de Nemours and Company, Inc. While employed by the latter Mr. Blouch traveled extensively in the development of electrolytic tin plate, copper, brass, and silver plating process.

### United Chromium Announces Three Additions

To further increase its service to users of Unichrome materials and plating processes, United Chromium, Incorporated reports the appointment of three highly qualified men to its technical and sales organization.

David E. Hartman will act as investigator and provide technical consultations on specialized applications of Unichrome products. His experience



includes business associations with Harco Products Corporation and the Metal and Thermit Corporation.



David E. Hartman



Don F. Edwards



James Martin



## BUNATOL PASTE TYPE INSULATION

A NEW and BETTER insulation requiring only two coats and a quick bake.

Lasts for months making cost-per-hour-of-use remarkably low.

Non - inflammable, non - evaporating because contains no thinner or reducer.

Complete protection through all metal finishing operations.

Get all the facts about this NEW, SUPER-TOUGH insulation now.

NELSON J. QUINN COMPANY, TOLEDO 7, OHIO

# BUNATOL

Expanding the Los Angeles branch of United Chromium are Don F. Edwards and James Martin. Mr. Edwards, with a degree in chemistry, served with L. M. Schwen Engineering Company as an electroplating chemist, and with Goodyear Synthetic Rubber Corporation as a development chemist. Mr. Martin, with over three years of service in the Navy, has recently received his degree in chemical engineering.

Each of these appointments will make available to a wider territory unichrome surface finishes, which include plating processes, materials for the plating plant, synthetics and lacquers for product finishing, and industrial protective coatings.

### Euras Names New Supply Outlet

E. Reed Burns Manufacturing Corporation announce the appointment of the A. B. Plating Supply Company, 1421 N. Water St., Milwaukee 2, Wis., as their district representative covering the State of Wisconsin and the northern part of Illinois.

Mr. A. F. C. Johnson of the above company is well known in the territory, being a member of the executive committee of the Milwaukee Branch of the American Electroplaters' Society. Mr. Johnson will represent the Burns Company in the distribution of their products which consist of the well known Climax brand polishing compound and Green Thread buffs and polishing wheels.

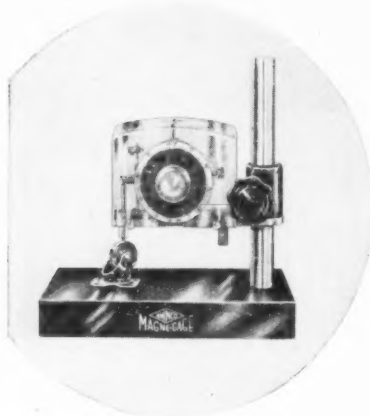
*Are Your Coatings\**

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Write for Bulletin MF-2125

### FILMETER

Measures the thickness of non-conducting coatings on non-magnetic base metals, also anodized coatings on magnesium, aluminum, and aluminum alloys. Measurements made electrically without destroying the coating being measured.

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**AMERICAN INSTRUMENT CO.**  
*Scientific Instruments*

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### Paul Conant Appointed by Optimus Detergents

*Optimus Detergents Company*, 104 Main Street, Matawan, N. J. manufacturers of industrial cleaning materials, announces the appointment of *M. Paul Conant*, of Paterson, N. J., as field service representative. He will cover Hudson, Bergen, Passaic and Morris Counties in New Jersey.

Mr. Conant has had a wide experience in the subject of industrial cleaning, having formerly represented *Turco Products, Inc.* More recently, he was with *Bendix, Inc.*

### Schmitt Addresses Swedish Scientists

*Henry M. Schmitt*, chemical industry manager for *Brown Instrument Company*, discussed automatic chemical

process control at a joint meeting of the Royal Swedish Academy of Engineering and Science and the Association of Technical Physicists at Stockholm, Sweden, June 7.

During his stay abroad Schmitt will visit several European countries which are now looking to the United States for modern electronic and other automatic industrial instruments for improved processing and manufacturing. He will make headquarters at *Honeywell-Brown* European offices in Great Britain and on the Continent.

### Lea Appoints Candee Director

*The Lea Mfg. Company*, Waterbury, Conn., manufacturers of burring, polishing and buffing compounds and developers of finishing methods, announces the appointment of *Ellsworth*



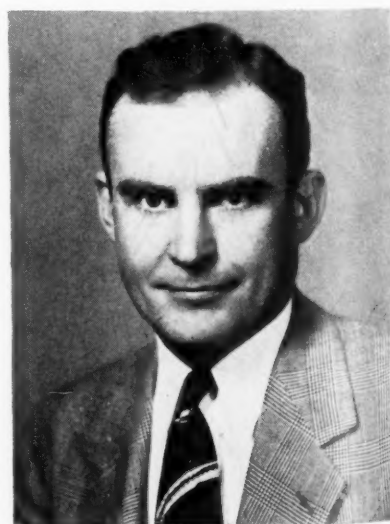
Ellsworth T. Candee

*T. Candee* as Director of Research and Development. Mr. Candee, formerly with the *American Metal Hose Branch* of the *American Brass Company*, assumed his duties with the *Lea* organization on May 15th. At the annual meeting of the company in February, he had been elected a director.

Mr. Candee, a graduate of *Rensselaer Polytechnic Institute*, is widely known in the plating industry. He has always been active in A.E.S. circles, serving as president of the national body in 1941-1942 and currently as Chairman of the Research Committee. He will bring to his new duties as Director of Research and Development for *Lea* a wide knowledge of industrial requirements and a keen appreciation of the possibilities that lie ahead.

### Electric Products Company Appoints Robert Kovach

*Mr. Gordon J. Berry*, vice president and sales manager of *The Electric*



Robert R. Kovach

Products Company, announces the opening of a new district office in Chicago at 915 Old Colony Building, 407 South Dearborn St.

Mr. Robert R. Kovach is the Chicago district manager and is responsible for handling all sales and service negotiations in the territory.

Mr. Kovach graduated from the University of Kansas in 1939 with a B.S. degree in mechanical engineering. After six years of sales and engineering experience as well as a year of management consulting, he joined The Electric Products Company in July, 1946.

#### Robertson Appointed Superintendent at Rust-Proofing



John T. Robertson

The board of directors of the *Rust-Proofing and Metal Finishing Corporation* of Cambridge, Mass., are pleased to announce the appointment of *John T. Robertson* as technical superintendent of its plant.

The highly specialized nature of the techniques and processes developed in the *Rust-Proofing Corporation's* Research Laboratory to meet wartime needs, now available to the trade, indicated the need of establishing the position of technical superintendent to weld together the activities of the technical forces employed in its plant.

Mr. Robertson served in the Armed Forces of the United States during the war for a period of three years. He was stationed at the Naval Research Laboratory in Washington, D. C. and was released from active duty with the rank of Lieutenant. He is a member of A.U.M.E. and The Institute of Metals.

## Filter All Plating Solutions Faster, More Completely in

### SPARKLER Horizontal Plate FILTERS

Because the filter cake is held horizontally, it is absolutely stable to the end of each filtering cycle. And cycles are longer because the cake retains its porosity longer. That is why the "horizontal principle," as embodied in Sparkler filters, gives you more efficient, low

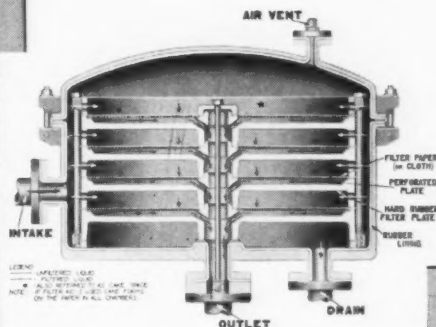
cost, operation. Sparkler filters are pressure-tight and leak-proof, designed for intermittent or continuous operation.

#### 4 Plating Solution Types

1. Rubber-lined for bright nickel
2. Stainless steel for acids
3. All Iron for alkaline solutions
4. All Steel (with Stainless Pump) for chromium

#### SPARKLER MANUFACTURING CO.

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Made in Capacities  
60 to 10,000 G.P.H.

See your supplier or  
Write for details

Our Engineering Service is available for any specialized problems.

#### Micromatic Hone Corp. Erects New Plant

To obtain increased efficiency and to improve working conditions, *Micromatic Hone Corporation* is erecting a 35,000 square foot addition to its present building at 8100 Schoolcraft, Detroit. The new facility will house all heavy machining and job honing operations, required by the Company's development of its new line of honing machine tool equipment.

The building will be modern "Tremor" construction; with maximum possible light and ventilation control. *Austin Company*, the builders, broke ground early in March.

#### Yerger Resigns from Lea

*The Lea Mfg. Company*, Waterbury, Conn., announces the resignation of *Charles W. Yerger* as Chairman of the Board with complete severance of all connections with the company.

#### Buckingham Products Moves to New Plant

*The Buckingham Products Company*, manufacturers of polishing and buffing compositions, has moved to its new plant at 14100 Fullerton Ave., Detroit.

The new plant has double the producing area of the old plant, with space





provided for anticipated production increases.

The company was organized 12 years ago by *R. M. Buckingham*. Mr. Buckingham has had 27 years' experience in the development and manufacture of metal finishing compounds.

The firm has over 35 representatives located in active industrial areas from coast to coast.

The growth of the Buckingham Products Company has been rapid during the past 12 years and today it is recognized as one of the leading polishing and buffing composition manufacturers in the United States.

As befits a leader in a rapidly growing industry, Buckingham is quite active in metal finishing associations and will be well represented at the Industrial Finishing Exposition in Detroit in June.

#### Robert R. Tanner Passes Away

*Robert R. Tanner*, 51, president of the *Tanner Chemical Company*, Detroit, died March 30. Mr. Tanner was an assistant professor at the University of Michigan and later was director of research for the *Parker Rust-Proof Company*.

## Associations and Societies

### AMERICAN ELECTROPLATERS' SOCIETY

#### Los Angeles Branch

One hundred and ninety members and guests, largest attendance at a monthly meeting in the history of the branch, attended the May 12 meeting of *Los Angeles Branch* of the *American Electroplaters' Society*.

The session was held in the canteen of the *L. H. Butcher Company's* new Los Angeles plant and office building at 3628 E. Olympic Blvd. as guests of the management.

Luncheon and collations were served in the spacious canteen on the second floor with the compliments of *W. D. Schwartz*, president of the company, with *Frank Bunker*, A.E.S. vice president, serving in an eminently satisfactory manner as headwaiter, assisted by Butcher-men *Jack Raskin*, manager of the plating department; *Earl W. Arnold*, director of the plating laboratory; and sales engineers *Harold Pres-*

## PREFABRICATED PLATING PLANTS!

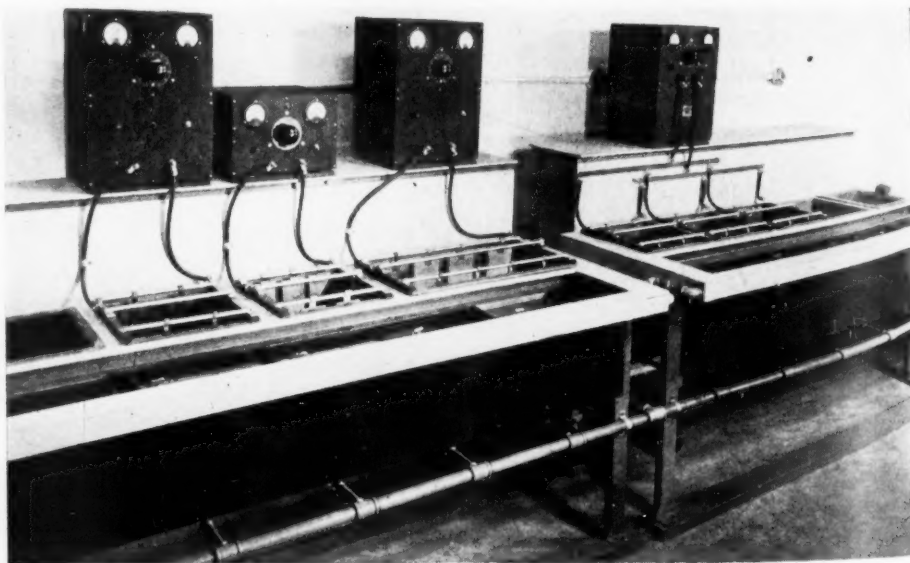
- ★ BUILT-IN GAS, WATER, DRAIN, EXHAUST, AND ELECTRICAL LINES.
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NICKEL	PALLADIUM
RHODIUM	SILVER
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ion. Julius Grossman, Leslie Rogers and Alfred Perkins.

An inspection tour of the plant as a whole, and specifically of the analytical laboratory and pilot plating plant operated by the Butcher Company, preceded the opening of the meeting.

Earl Coffin was appointed by retiring president David N. Eldred to install the new officers headed by 1947 president Howard Woodward of the Sundmark Supply Company.

A committee composed of Mr. Coffin, Don Bedwell and E. W. Wells presented a report on its study of the proposed changes in the Supreme Society constitution and by-laws.

The committee submitted as its opinion that the new proposed constitution and by-laws are poorly organized and arranged and, in some cases, inadequately phrased, with the result that the meaning and intent are not clear. The committee also declared that several of the proposed changes are somewhat radical in nature and should be given more careful consideration by the membership of the Society before being adopted. Specifically, the committee reported that it saw no reason for deleting the word "American" from the name of the organization.

The committee further reported that it felt that the method suggested in the new constitution for the election of national officers has no particular merit, would be cumbersome and entail a lot of work, and that the delegate system as used in the past has been quite satisfactory.

Delegate representation for branches in proportion to membership was recommended by the committee.

The committee recommended that the new proposed constitution not be adopted at the June convention, but that the national committee be retained and instructed to survey opinions from all branches and from them develop a new constitution and by-laws to be submitted for the 1948 convention.

The Coffin committee's recommendation that Los Angeles Branch instruct its delegates to the 1947 convention to vote "No" on the proposed new constitution and by-laws was carried unanimously.

A final report submitted by retiring Secretary-Treasurer Emmette R. Hol-

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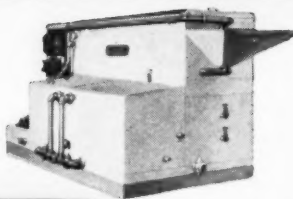
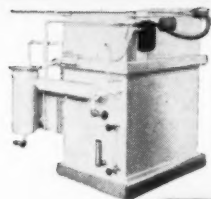
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**HARRISON**

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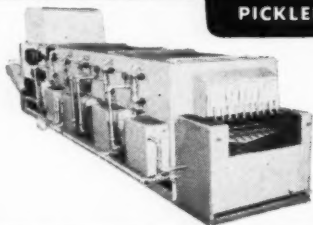
AND COMPANY, INC.  
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## For **DEGREASING • WASHING RINSING • PICKLING and DRYING** of **METAL PARTS**



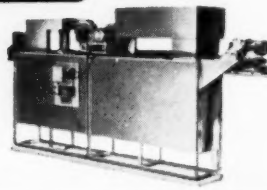
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**Standard and Special Types of equipment from the smallest to the largest sizes for a wide variety of metal degreasing, washing, cleaning, rinsing, pickling, drying and allied process operations.**

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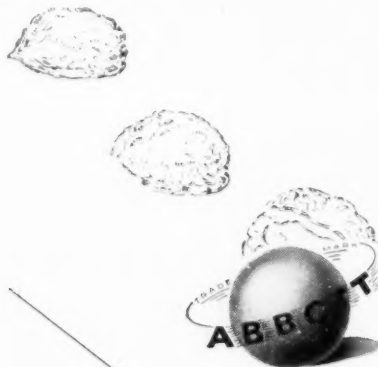
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man disclosed that Los Angeles Branch, as of May 1, had 201 members as compared with 186 on May 1, 1946. During the year, 33 new members were added by election and six by transfer, five resigned, two passed away, and 19 were suspended.

Holman's report also disclosed that the Los Angeles Public Library has been supplied with a 32-year file of the *Monthly Review*, complete back to 1915, and with back issues of the *Annual Proceedings* through 1927, with a few breaks which are expected to be filled in as copies are obtained.

The speaker at the May 12 educational session was Earl W. Arnold of the L. H. Butcher Company's plating laboratory staff, who spoke on his experiences as supervisor of the laboratory in charge of plating and research at *Cadillac Motors*, Detroit. His subject was "Plating Automobile Parts."

This was followed by a sound motion picture film, "The Story of Nickel—Highlights of Production," courtesy of the *International Nickel Company*.

### **Twin City Branch**

The *Twin City Branch* of the *American Electroplaters' Society* met Tuesday, May 5th, at the Covered Wagon in Minneapolis. There were 47 persons present.

President *Lillicrop* introduced and welcomed the following guests:

Mr. *Armstrong*, Josten's Co., Owatonna, Minn.; Mr. *Stan Kuhn*, Josten's Co., Owatonna, Minn.; Mr. *Stan Fox*, Josten's Co., Owatonna, Minn.; Mr. *Anderson*, Josten's Co., Owatonna, Minn.; Mr. *Tom Davey*, Ardeo, Chicago, Ill.; Mr. *Wm. Johnson*, Industrial Filter & Pump Mfg. Co., Chicago, Ill.; Mr. *Fred Strum*, Speed-O-Lac Products, St. Paul, Minn.; Mr. *Len Truman*, Nat'l Pressure Cooker Co., Eau Claire, Wis.; Mr. *Warren Nelson*, Nat'l Pressure Cooker Co., Eau Claire, Wis.; Mr. *Robt. Hawkins*, Hawkins Chemical Co., Minneapolis, Minn.; Mr. *A. J. Fischer*, Universal Plating Co., Minneapolis, Minn.; Mr. *Jay Fischer*, Universal Plating Co., Minneapolis, Minn.; Mr. *Herb Brunzel*, Minneapolis Honeywell Reg. Co., Minneapolis, Minn.

Mr. *A. T. Leonard*, membership chairman, introduced a new member, Mr. *Robert H. Berg*, and welcomed him into the branch.

*Robert Buckley*, branch secretary,



reminded those present of the coming convention. A list of those members with perfect attendance was read, as a drawing will be conducted at the June Party for a worthwhile prize.

The auditing Committee's report from Mr. Norman A. Glenn, chairman, was read in which was stated that the branch's books were found in order.

The next matter of business was the election of officers. The new officers for the 1947-1948 year are: Mr. A. T. Leonard, president; Mr. R. M. Krieger, 1st vice president; Mr. Frank Ireland, 2nd vice president; Robert L. Buckley, secretary-treasurer.

Mr. G. W. Lillicrop, retiring president, was presented with the past president's gavel by the new president, A. T. Leonard.

A report on the coming third Annual Party was given by John Lynard, chairman. The party will be held on Thursday, June 5th at the Covered Wagon, Minneapolis.

Following the business meeting, Dr. Frank Ireland, branch librarian, introduced Dr. H. L. Kellner, technical director of Lea Manufacturing Company, who spoke on "Polishing and Buffing of Metals." Movies were shown in addition to a demonstration of spray-buffing. Dr. Kellner's talk was most interesting and well appreciated.

#### Baltimore-Washington Branch

At the May meeting of the Baltimore-Washington Branch of the American Electroplaters' Society, there was a good turn-out of members and guests to hear Dr. Abner Brenner deliver his farewell address as president before turning the Branch over to the new president, Robert Guerke, who in turn had Nathan E. Promisel present the speaker of the evening—Frank K. Savage of the Kuehne Manufacturing Company of Mattoon, Ill., and president of the A. E. S.

Mr. Savage opened his remarks with a general report on the activities of the supreme society during the past year, especially on its activities and redrafting of a new constitution for the society which will be acted upon at the forthcoming national meeting of the society.

Following this report Mr. Savage delivered an informative and interest-

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... ***all BUFF***  
***through and through!***



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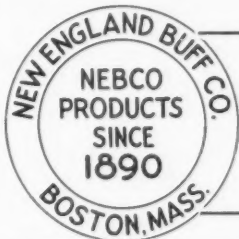
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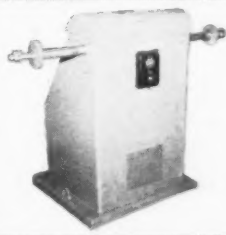
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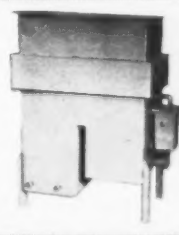
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ing illustrated lecture on "Electroforming." In his discussion he reviewed the literature on the efforts and accomplishments of electroforming during the past 100 years with special emphasis on some of the experiences he and his associates had in making metal wind musical instruments and kettledrums. He illustrated his talk with lantern slides and many blackboard sketches to make clear how certain engineering and plating difficulties were overcome. He concluded his discussion with a graphic presentation of how he and his associates learned to use the lowest grades of scrap copper.

After concluding his two hour discourse *Ken Huston*, vice president of the National A. E. S., on behalf of the Baltimore-Washington Branch, presented to Mr. Savage an unusual type of pot with a number of different kinds of electroplating superimposed upon each other. The pot given is made of aluminum. It is dip-coated with .0006 inches of silver. This is then polished and the inside is coated

half way down with .001 inches of cadmium from a bright bath. The handle is gold plated over copper and the entire process is recorded in a plastic sandwich held to the pot with

tin plated resistance wire. These coatings were all commercial applications during the war. The silver was masked off around the center part to show the copper plate underneath. The whole



From left to right are Fred Fulforth, past president, 1941; Frank K. Savage, president; Dr. William Blum, honorary member of the Society; T. F. Slattery, past president, 1936; and Kenneth M. Huston, first vice president.

## LaMotte Plating Control Equipment



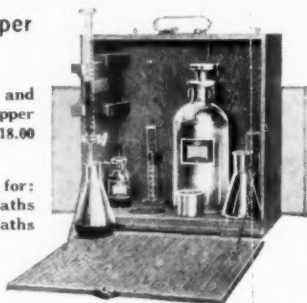
### The LaMotte Acid-Copper Analytical Set

For accurately determining and regulating both the acid and copper content of the bath. Price \$18.00 f.o.b. Towson, Md.

Similar units also supplied for: Nickel content of Plating Baths; Control of Chlorides in Plating Baths; Nickel-Chloride Control in single unit.

(Prices upon request)

The active acidity and alkalinity of electroplating and electrotyping baths (\*) for the uniform deposition of metal are now universally controlled by the pH method. LaMotte Block Comparators are standard equipment in this field. They are also required for careful pH control of Metal Cleaning Solutions(\*). Price each \$12.50 f.o.b. Towson, Md.



### The LaMotte Plating Control Unit, Model U7

This LaMotte Outfit provides for the control of Acid Copper, Cyanide Copper, Acid Zinc, Cyanide Zinc, Cadmium, Brass and Bronze Plating solutions.

Complete with instructions \$50.00 f.o.b. Towson, Md.

Additional equipment for analysis and control of silver baths can be added to the above unit at a cost of \$5.00.

(\*) Reports on various Plating Control Processes are available without obligation. Write for them.

If you do not have the LaMotte "ABC of pH Control," a complimentary copy will be sent without obligation.

**LaMotte Chemical Products Company**  
DEPT. "MF" TOWSON, BALTIMORE 4, MD.

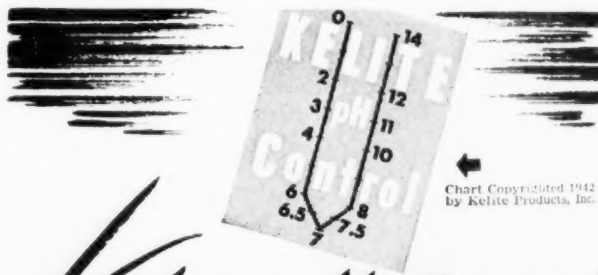


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# Kelite pH Control

**takes the Guesswork out**  
of industrial cleaning  
and processing... makes  
possible faster, better,  
more efficient operations.

Phone your local Kelite office for a Kelite Service Engineer

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INDUSTRIAL CHEMICALS FOR CLEANING & PROCESSING  
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unit was coated with a moisture repellent clear varnish containing a fungicide. The inscription on the pot reads: "Frank K. Savage, President, American Electroplaters' Society—1946."

The meeting was concluded by the serving of refreshments prepared under the direction of Miss Grace E. Riddell, secretary of the branch.

## News from California

By Fred A. Herr

A total of 134 years of membership in the American Electroplaters' Society was represented by four men seated at the same table at the May meeting of Los Angeles Branch, A.E.S. They included:

**Ernest L. Lamoreaux**, honorary life member of Los Angeles Branch, who joined Chicago Branch as a charter member in 1912 after several previous years affiliation with the platers' society in New York ..... 35 years

**Clarence E. Thornton**, manager of L'Hommedieu's west coast division, who was a charter member of Chicago Branch (1912) and subsequently transferred to Los Angeles ... 35 years

**Frank Rushton**, manager for La Salco of St. Louis on the Pacific Coast, charter member of St. Louis Branch (1915), later transferring to Los Angeles ..... 32 years

**Rudi J. Hazucha**, representing The Clinton Company, Chicago, a member of Chicago Branch since 1915 ..... 32 years

134 years

**Sargent Engineering Corporation**, 2533 E. 56th St., Huntington Park, Calif., has completed installation on a new black oxide setup for processing bits, liners and other oil well tools. The installation was made by **Du-Lite Chemical Products Company** of Los Angeles, headed by **A. J. Ahlschlager** and **J. M. Bowman**. This firm is in process of organizing a sales engineering staff to cover the Southern Cali-

# RECTIFIER *Facts* .. Not Fiction

Wagner-Tiedeman Electroplating Rectifiers put other sources of direct current in the horse-and-buggy class. Here are features important to electroplaters who like to keep "an ear to the ground and an eye to the future" . . .

## 1. FLEXIBILITY

Equipment can be shifted where needed. Eliminates costly guesswork in estimating power demands. • First installation simple and inexpensive. Expand as needed by paralleling into system. • Units quickly replaceable in case of accident. Eliminates wrecking single unit high amperage system. Unit rectifiers easily shifted in emergency.

## 2. LOW INSTALLATION COSTS

Lower starting loads means smaller feed lines. • Light weight permits hanging or stacking to save floor space. • No expensive foundations required. • Small units may be tucked away in otherwise wasted corners.

## 3. SIMPLE SERVICING

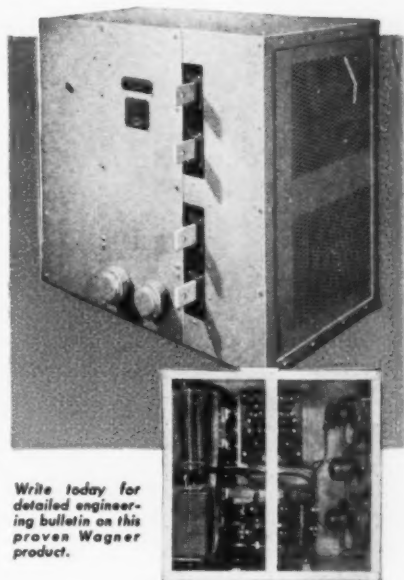
Anyone can service the three major components, fans, transformer and selenium stacks. Stacks fused, everything visible. • Parts and factory service within 24 hours. No plant tie-up for days or weeks for repairs to single unit high amperage system.

## 4. LOW MAINTENANCE COSTS

Eliminates special service men. • Fans are only moving parts; low velocity, low bearing speeds. • Periodic maintenance (cleaning by compressed air).

## 5. LOW OPERATING COSTS

Wagner-Tiedeman Rectifier produces low voltage high amperage Direct Current from an Alternating Current source for less money.



Write today for detailed engineering bulletin on this proven Wagner product.

## FEATURES

Selenium-on-aluminum cells handle momentary overloads up to 1000% of normal. Effective rectifying area over 4300 square inches. Three 40-watt fans provide ample low-velocity cooling. Transformer, two winding type, reserve capacity. Welded steel enclosure for vertical stacking if higher power is desired.

## SPECIFICATIONS

Output, 6 v. at 1500 amp., 12 v. at 750 amp., Input, 220/440 v. 60 cycle 3 ph., power drain approximately 12 Kw. at full load. 34" high, 36" long, 22" wide, floor area 5.5 sq. ft. Weight, approximately 500 lbs. Other voltages and current capacities available.

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No obligation for interviews.  
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## —for better finishing on metal surfaces

PERMAG Cleaning Compounds positively remove those minute particles which would mar the fine finish of your product—and cause rejects.

PERMAG cleans rapidly as well as keeping cleaning costs at a minimum. Metal fabricators are relying more and more on the efficiency and safety of PERMAG cleaners. PERMAG never injures soft metal surfaces, while producing a chemically clean surface.



fornia area, with *W. D. Burman* recently appointed as the nucleus of the new field force.

*John F. Beall*, formerly sales engineer for the *Harshaw Chemical Company* at Los Angeles, and several associates now operate *Lawson Time, Incorporated*, manufacturers of electric clocks in Pasadena. The plant at 317 E. Orange Grove Ave. is equipped with facilities for handling bronze, gold, silver and chrome plating.

*R. J. Hazucha* of *The Clinton Company*, Chicago, is employing the Rotary Club system in keeping unbroken his amazing attendance record at American Electroplaters' Society meetings. A member of Chicago branch since 1915, Mr. Hazucha had not missed a meeting in 32 years, which adds up to some 380 consecutive meetings. As a member of the *Koppy Kat* bowling team of Chicago he attended the recent American Bowling Congress in Los Angeles, which caused him to miss the May 9 A.E.S. meeting in Chicago. He kept his record intact by attending the May 13 session of Los

Angeles Branch, where he enjoyed a pleasant reunion with several ex-Chicagoans of long ago—*Ernest L. Lamoreaux* and *Clarence Thornton*.

*Weiser Manufacturing Company*, producers of hardware specialties and brass and aluminum castings, has construction underway on a one-story, 40x115 foot factory building adjacent to its main plant at 8635 Otis St., South Gate, Calif.

A \$431,000 building project underway at Tropa, Calif., for the *American Potash & Chemical Corporation* of Los Angeles involves the construction of a filter building, main control building, dyer building and soda ash loading building. The project will add approximately 28,000 square feet of floor area to the corporation's production facilities in the Mojave Desert area.

New incorporations announced in California during the past month include:

*Glaspray Process Co., Inc.*, \$100,000, San Francisco, incorporated to

deal in spraying, applying and coating metal, mineral, glass and wood, by *E. A. Larkin* and *H. L. Kaufmann*, San Francisco, and *W. E. Schink*, Stockton, Calif.

## Letters to the Editor

Editor

Metal Industry Publishing Co.  
11 West 42nd St.  
New York, New York

Gentlemen:

In your February issue of *Metal Finishing*, you published an article under "Shop Problems" which was entitled, "Finishing Sterling Silver."

The primary problem, as we saw it, seemed to be to remove the rouge and clean the item properly before lacquering.

Through experience and experimentation, we have found the following simple procedure very successful and

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feel it will give you satisfactory results. After roughing and buffing in the regular manner, wash the items in hot *Farnoline* or kerosine. Since either of the above suggested preparations will leave an oil deposit, the items should then be degreased in the regular manner.

Sincerely yours,  
G. M.

Metal Finishing,  
11 W. 42nd St.,  
New York 18, N. Y.

Gentlemen:

It may be of interest to you to learn I have taken *Metal Industry*, now *Metal Finishing*, since 1913—I do not want to stop now. There is always something new in it to learn.

Wishing you long and continued success, I remain

Sincerely,  
W. A. THROOP,  
Director of Finishes

Metal Finishing,  
11 West 42nd Street,  
New York, N. Y.

Just reading that nicely laid out short-cut procedure by George Black and Jack Sinner for "Identification of Plated Coatings" on the Dec. 1946 issue of your review. I notice the following little omission, which might be misleading for some of your readers:

On page 530, right column, first paragraph, 13th line from top, after the word "blotter," should be the advice:

"making the blotter ammoniacal by holding it over an open bottle of concentrated Ammonium hydroxyde," after which it should go on as printed "and then spotting . . ." etc., because, as you know, the dimethylglyoxime test does not work in acid state.

I do not know whether you will care to correct that, but leave it to your judgment.

Sincerely yours,  
KARL NELL.

## NEW BOOKS

*Galvanizing Handbook*, by J. R. Daesen, published by Reinhold Pub-

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Work comes from plating tanks with bright, fine grained, adherent deposits. No color buffing or burnishing is required. Work may

be transferred direct from nickel to chromium bath, without intermediary buffing, re-cleaning, or re-racking. Excellent for zinc die-castings.

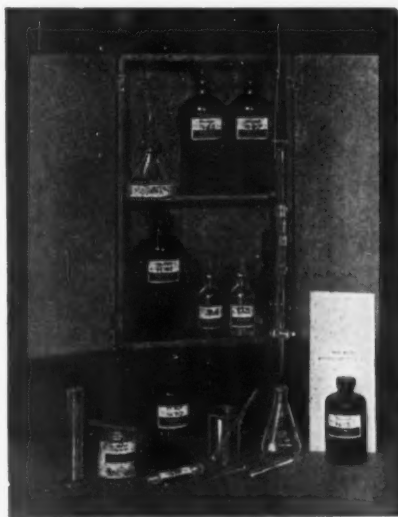
GUARANTEED NOT TO HARM PLATING SOLUTION. Will not cause plate to peel, become brittle, or produce streaky deposits. Illustration shows unbuffed deposits produced before and after addition of NEW IMPROVED LUSTREBRIGHT. Write for complete information.

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The handbook presents a very clear picture of the basic principles involved in galvanizing with zinc. Photographic examples of the nature and cause of many defects in galvanizing practice are given. Operating methods for various basis metal designs and compositions are outlined quite thoroughly, giving profuse illustrations of many installations. Equipments used in all types of galvanizing practice are explained as are cooling, fluxing and heat treatment of the coatings.

The major portion of the book is of course devoted to galvanizing with zinc; however, a chapter is devoted to hot dip coatings with other metals.

The appendix contains valuable information on testing of zinc coatings, preparation of sections for photomicrography, density and strength of acid solutions, A.S.T.M. standard specifications for galvanizing and a bibliography.

The handbook is comprehensively set up and makes a valuable addition to anyone interested in any form of galvanizing.

After two and a half years of research and preparation, the *National Safety Council* has published its new *Accident Prevention Manual for Industrial Operations*, which the Council believes is the most comprehensive treatment of the fundamentals of safety available in one volume.

The 544-page manual, containing 400 illustrations, charts and tabulations, is intended as a handy and authoritative source of accident prevention information for safety directors, safety engineers and foremen. Each of the fourteen major divisions of the book is preceded by a summarizing index for quick location of general topics, while a twelve-page detailed alphabetical index at the back gives access to details.

Although prepared primarily for the manufacturing industries, much of the information is applicable to non-manufacturing industries and to those with industrial operations, such as railroads and ship operators. Insurance engineers will find it a prolific source of information.

The fourteen major subjects covered are: plant design and layout,

construction and demolition, permanent equipment and facilities, guarding and operating machinery, materials handling and storage, electrical hazards, chemical hazards, fire and explosion hazards, flammable liquids, hand and portable power tools, commercial vehicle operation, personal protective equipment, industrial hygiene, and safety organizations and programs.

The manual is available to both members and nonmembers of the Council. Further information may be obtained by writing the National Safety Council, 20 North Wacker Drive, Chicago 6, Ill.

## TECHNICAL LITERATURE

Aluminum offers many valuable and interesting combinations of surface finishes for enhancing its appearance. To indicate some of the important possibilities, *Reynolds Metals Company* has published *Finishes for Aluminum* in two volumes.

The first book, *Section One*, is wire bound and contains 108 pages devoted to 8 cleaning treatments, 17 mechani-

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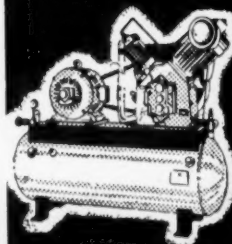
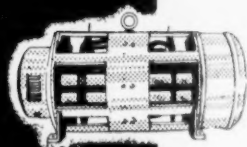
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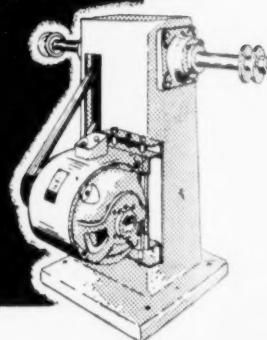
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cal surface finishes, 15 chemical surface finishes, 11 electrolytic oxide treatments, 12 electroplated coatings, 7 paint application methods, 7 paint coatings, ceramic coatings (vitreous enamels), special finishes such as silk screen and sprayed metal finishes, and concludes with a discussion of various controls and tests for finishes.

The second book, *Section Two*, supplements this information with 120 pages of shop data on materials, equipment, solution preparation, procedure and control for more than 30 of the most widely used finishing processes. This book is supplied in a separate loose-leaf binder and new and revised bulletins will be issued at intervals to keep this information up-to-date.

*Finishes for Aluminum* (two volumes) thus supplies to users of aluminum a complete and continuing service unique in the finishing field. It offers an effective means of keeping up with the many advances being made in this phase of aluminum processing. Copies are available from Reynolds Metals Company, Dept. 27, 2500 So. Third Street, Louisville 1, Ky. Price \$2.00.

*Work Measurement Manual*, by Ralph M. Barnes, 153 illustrations, published in 1947 by Wm. C. Brown Co., 973 Main St., Dubuque, Iowa. Price \$3.75.

This volume explains briefly the importance of time study, the procedure commonly used in making a time study, the Work Measurement investigations now being conducted by Professor Barnes, and some of the preliminary findings. It tells how to conduct a community time study survey and gives the results of two such surveys. This manual will serve as a guide for those interested in improving the ability of time study men to set accurate and consistent time standards.

The book also contains a section on the use of standard motion-time data for such operations as punch presses, hand screw machines, turret lathes, sensitive drills, and hand tappers.

The final section of the book gives a full report by companies of an industrial engineering survey recently made by Professor Barnes. Eighty companies employing from 50 people to 15,000 people participated in this study.

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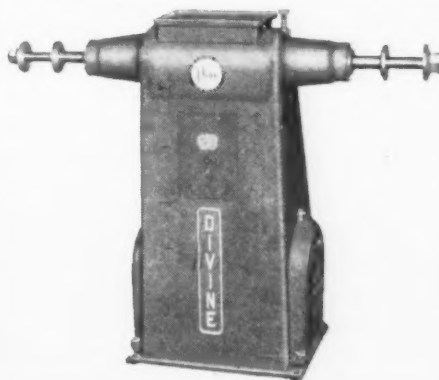
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